RAILROAD GAZETTE

FRIDAY, AUGUST 7, 1903.

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Contributions

Pneumatic Lift.

Williamsport, Pa., July 24, 1903.

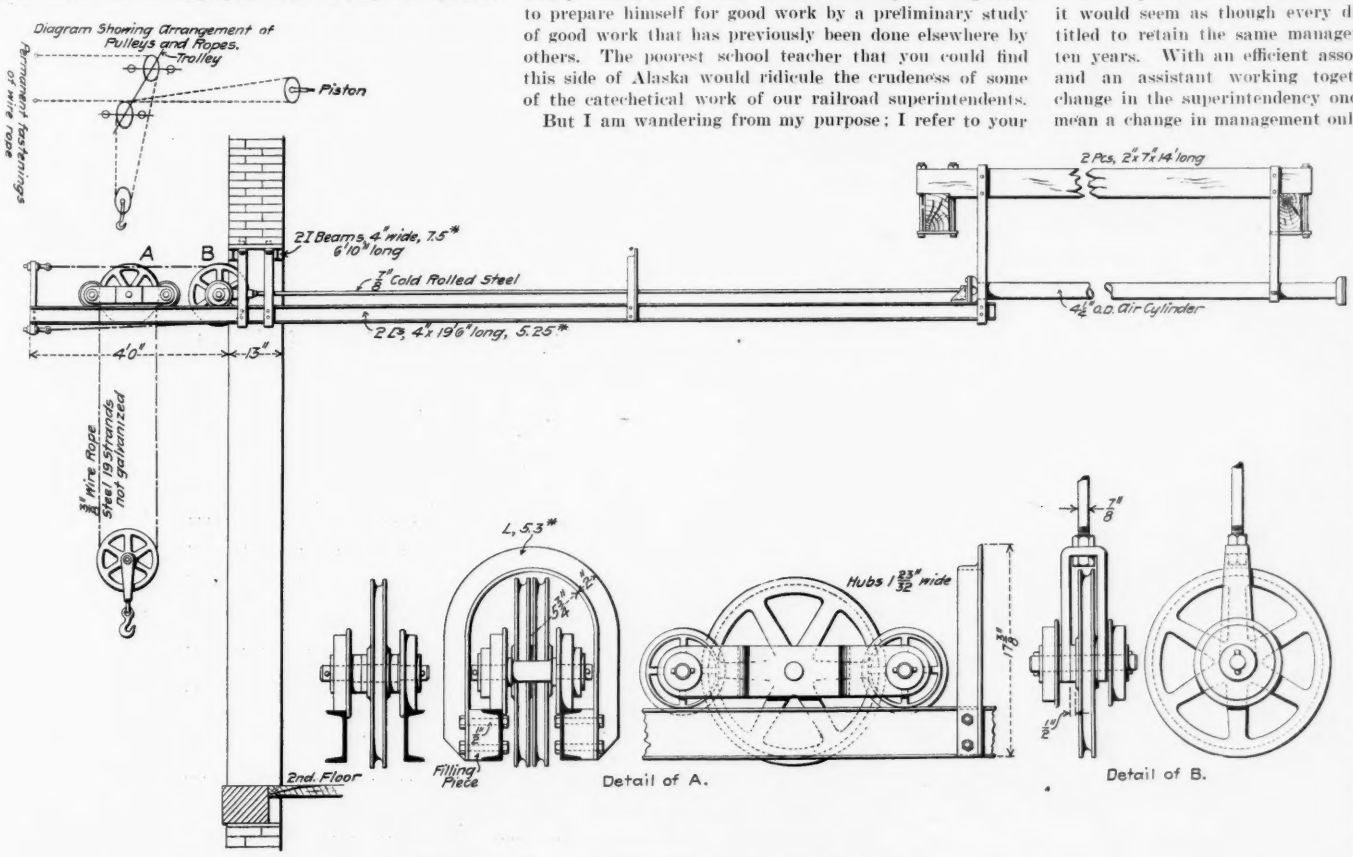
TO THE EDITOR OF THE RAILROAD GAZETTE:

I submit herewith plan and details of an air lift of about 1,000 lbs. capacity which I consider unique. The load after being lifted the desired height is transported by the operator pulling the trolley to any desired distance from the door—the distance being governed by the location of the air cylinder, which can be at the opposite side or end of building by making the trolley runway the desired length.

The plan shows the pulleys arranged for a single or direct lift, but I know of no reason why any desired ratio could not be employed, thus making the cylinder shorter, care being taken to make the sheaves large enough. It will be observed that the principle on which this acts is that the reactions at the permanent fastenings are equal to the pull on the piston, thus allowing the trolley to be pulled either way after the load has been lifted, it being only a question of the pulleys adjusting themselves to the position of the trolley without raising or lowering the load.

This device is not patented and has been in successful operation for the past seven years in the brass buffing department of the Altoona car shops, and is original with the writer, who gladly submits it to the progressive mechanical world.

A. P. SHARP,
Chief Draughtsman, Motive Power Dep't P. & E. R. R.



Pneumatic Lift—Altoona Shops, Pennsylvania Railroad.

The Right to Work.

Oshkosh, Wis., Aug. 2, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring to "Inquirer's" contribution about trade unions. While much that he says is true in one sense it is wrong in another. Because any one man commits a crime it does not follow that another has the same right. If railroad corporations disregard the law it is still both right and proper for union men to live within the law and confirm by their acts that the law can be obeyed and that it is wrong to violate it. Any union denying the individual workman the right to work is wrong and is making a direct violation of the law and of the basic principles of our government. It follows logically, with the same process of reasoning, that any man or number of men may employ whom they see fit, union or non-union, as long as they pay them for the service rendered. Has a union ever thought of right or justice when it ordered a strike? Has a strike ever been ordered by the sane and conservative element of any union?

GEO. B. MOYER.

The Superintendent as a Judge.

New York, July 18, 1903.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Nothing could be more fitting and necessary than the plea which you from time to time make for rational methods in examining train and station men on the rules. To prepare a well defined plan of the time and manner of examining and re-examining employees, and then to stick to it, is a most obvious duty of the superintendent; and it seems almost incredible, when you calmly consider the subject, that happy-go-lucky methods are so common. To know that your engineers are not living in what is practically complete obliviousness to some important rule, such as that requiring them to report misconduct of fellow-employees, or to report certain happenings in writing, is as important as to know that they are not color-blind or nearsighted. Moreover, those superintendents who do examine their men, and who, in the course of the work develop many useful kinks whose value had not been appreciated at the outset, do not take enough pains to give their experience to the world; the next superintendent who takes up such a job has to rediscover a lot of things which he ought to have learned from somebody in advance. Now and then the *Railroad Gazette* announces that some road has had a systematic examination of its men: but in every case a perusal of the rules and questions shows that the man in charge has neglected to prepare himself for good work by a preliminary study of good work that has previously been done elsewhere by others. The poorest school teacher that you could find this side of Alaska would ridicule the crudeness of some of the catechetical work of our railroad superintendents.

But I am wandering from my purpose; I refer to your editorials because they remind me of one thing that you do *not* teach. I do not want to discuss the training of employees, but the training of superintendents. How well does this officer carry out his own ideals? One reason why superintendents do not lead their subordinates up to higher standards is that they do not themselves live up to the highest standards that they theoretically recognize. Do you ever reflect, Mr. Editor, that the division superintendent needs to be as wise and firm and far-sighted as a judge of the supreme court? Aye, he needs to be wiser and firmer, if that were possible, as he has not the advantage, in his performance of judicial functions, of being removed from the personal presence and influence of the contesting parties whose controversies he adjudicates. He is judge of the petty or lower court as well as of the higher. I refer, of course, to the decisions which a superintendent has constantly to be making on the discipline and punishment of his men. To the conductor or engineer hauled up for misconduct he has to be counselor and friend as well as a just judge. This dual relation demands of the superintendent most careful thought, for the judicial function imposes on him a constant fight within himself: the strife between his reason, which tells him to be rigid and just, and his humanity which impels him to leniency. Probably the best superintendent, in this respect, is the one who is naturally cold but who has cultivated enough human sympathy to keep him from being unduly severe.

But, whatever the problems that confront the superintendent, some of the duties devolving on general managers are quite plain. We tell the superintendent that he must enforce discipline, even if he finds it necessary to dismiss a man possessing many good qualities; do we take equal care to supplant a superintendent when it clearly appears that he is only about 75 per cent. of what he should be? No; the difficulty of getting one who is experienced in the work and energetic in managing his division; pleasant and diplomatic in dealing with the public and agreeable as a member of the general manager's official family, deters us from doing a plain duty; we tolerate a second-class officer. If he is a friend or relative of a director of the road we even try to justify ourselves in such inaction. Much inefficiency in superintendents' offices is plainly due to the failure of the management to get the best man possible.

The next difficulty is brevity of tenure. This is not so easy a problem to preach about, but it is an important question. All will admit that superintendents should not be frequently changed; but if a place in the higher ranks is to be filled, a superintendent is usually needed to fill it, because superintendents have had better education than other available candidates. Superintendents aspire to and deserve advancement; but when business is constantly expanding, as during the past five years, the necessary promotions keep the superintendencies all the time changing. The only remedy appears to be to have understudies to division superintendents. Give them any title you choose, but have men who shall be so well in touch with the actual management of the division that taking away the superintendent will not make a bad break in the conduct of the office. Such an associate must be selected, not for his fitness to play second fiddle, but with a view to his probable ability to manage the division when his superior has to leave; and to train him for this, let him run the office when the superintendent is away. While it is not practicable to have a fixed minimum time-limit, it would seem as though every division ought to be entitled to retain the same management for from three to ten years. With an efficient associate—a superintendent and an assistant working together in full accord—a change in the superintendency once in three years would mean a change in management only once in six; and with suitable stability of policy, the successive changes would not mean complete overturn.

Remember, Mr. Editor, that I am just now considering the superintendent in the light of his judicial function. If you are inclined to think my demands unnecessary, bear in mind that the judge of a court holds his office for life; or at least for a term of many years. The superintendent needs to be assured of his hold on his present position (for, say, five years) in order to give his best efficiency in any department of his work; but he needs to be assured of a still longer tenure with the company, if he is to be the best possible disciplinarian. Only in this way can he rightly develop his courage and his interest in the business. If you have doubts whether you wish to keep a certain superintendent for life, those doubts should be settled, one way or the other, as quickly as possible.

After the general manager makes sure that he wants his superintendents to stay with him indefinitely, the next thing is to make them equally averse to a change,

This means liberal salaries. The superintendent of a division is the most important active officer in the conduct of a railroad. All above him may be called either accountants or advisers of the directors; but he must sail his own ship, with an independent hand. Such an important officer should be contented in his office. It would, probably, be fair in many cases to give him almost as much as the general superintendent. If thoroughly competent for his job he can easily earn quite as much. With equal salaries, the division officers would have nothing but the expected honors and privileges to lead them to accept the general superintendency, if offered; but should not these be enough?

With things as they are, on most American railroads, the general manager could do a great deal of good by getting his superintendents to study. Some of your readers will now accuse me of being unpractical; of ignoring the pressing active duties that occupy the superintendent's mind every day and make him disinclined to academic research; but I believe I am right. The majority of superintendents have not had a college education; and every one of such who devotes a small part of his time to reading, has occasion at the end of every year to look back with marked satisfaction on the results. His daily work does indeed broaden his character; but he should be deepening it at the same time. As our common schools do not accomplish their best work except as they are enriched by streams from higher sources—the universities, the poets and the philosophers—so the everyday work of a railroad officer, or of the manager of any large business, needs the stimulus of ideas from men who are not cramped by the sordid influence of immediate business exigencies. If a superintendent is to perform rightly the important judicial functions that I spoke of at the beginning of this letter, he must cultivate the judicial temper. This means, among other things, to train himself in firmness. Let him read the biographies of our great supreme court judges. Current decisions of the supreme court, in cases which concern railroad matters and therefore are not dry reading, afford a good stimulus for a man who must decide knotty problems. A superintendent should observe (which means going away from home to investigate) how cases similar to his own are decided by other superintendents. If one finds others weak kneed he will be incited to go home and exercise firmness, because in a distant case he can clearly see the bad results of weakness. If he finds other men firm he will be ashamed to go home and be anything but firm himself.

Those of your readers who manage railroads successfully without following out the policy that I have suggested, would confer a great favor on a multitude of managers and superintendents by telling how it is done; for many of us feel convinced that the only rule of progress is to adhere to these principles. Get competent superintendents, even at the expense of much time and care in selecting or searching; keep such men in their places by adequate salaries; have understudies; keep the superintendent in full sympathy with your policy by letting him know that you will probably want him for a higher place when he outgrows his division; constantly encourage every superintendent to broaden his mind by contact with ideas outside of his own narrow field. Every superintendent purposes, more or less courageously, to be a just and firm judge when disciplining his men. To strengthen that purpose where it is weak, the only adequate course is that which I have here outlined. What do you think about it?

W. L. R.

The Plattsmouth Bridge of the Burlington.

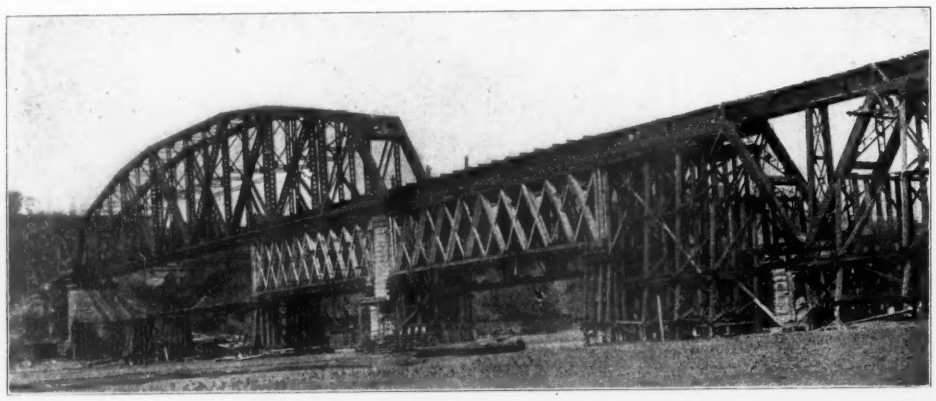
Rebuilding the Burlington bridge across the Missouri River near Plattsmouth, Neb., is practically completed. The new structure replaces the bridge built in 1879-80 by the Burlington & Missouri River, for which Mr. Geo. S. Morison was chief engineer. With approaches it originally consisted of four 30-ft. plate-girder spans, two 400-ft. through spans, three 200-ft. deck-girder spans, and 48 spans of 30-ft. deck plate spans on trestle posts. All but three of the spans of the east approach were filled in some years later.

The old structure was designed for two consolidation locomotives, each weighing 75 tons, followed by a train of 2,000 lbs. per lineal foot of track. The growing weights of locomotives had exceeded the safe allowable load some years ago, and it became necessary to place restrictions upon the use of the bridge. This proved a serious hindrance to traffic, and renewal was decided upon.

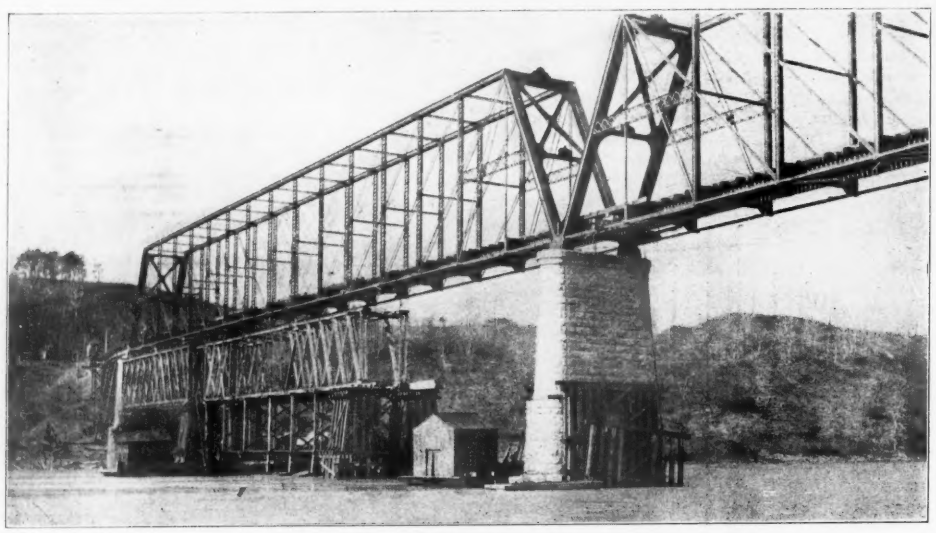
The plans provided for the replacement of the west 400-ft. span, the substitution of two 200-ft. deck spans for the east 400-ft. span, rebuilding two of the three 200-ft. deck spans, and doubling up the east span with one of those replaced. Consideration was given to making the new bridge a double-track structure, but after carefully weighing all of the conditions it was decided that the traffic requirements would not justify it, as an entire new structure, from caissons up, would have been required.

The substitution of two 200-ft. deck spans for the east 400-ft. span required an additional pier. This pier was built on a pneumatic foundation carried 45 ft. below low water to bed rock. The pneumatic foundation work was done by the William Sooysmith Company, Chicago. The footing course of the pier, on top of the caisson, is concrete, mixed 1-3-6, faced around the pointed up-stream end with a ⅜-in. steel plate. The rest of the pier is granite, cut so as to bond across the pier, the headers on one face bordering with those on the other at least 1 ft. The pier is 8 ft. thick under the belt course, which is 8 ft. 6 in., with a 9-ft. coping course. This pier conforms in general design to the others.

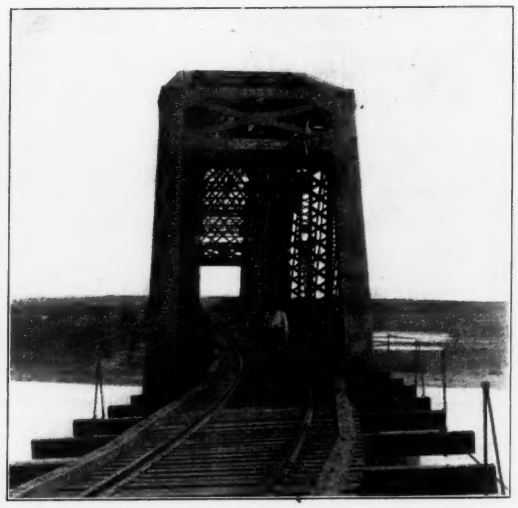
The condition of the piers supporting the deck spans made renewal necessary. The east pier, No. 6, was founded upon a block of concrete 3 ft. thick, resting upon the sand 6 ft. above low water. Pier 5 was founded



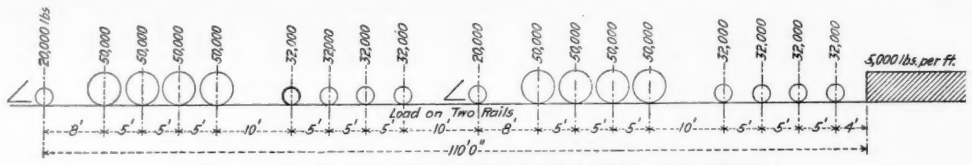
New Spans in Position; Falsework Partly Removed—Plattsmouth Bridge.



Erecting Falsework Under Old Spans—Plattsmouth Bridge.



West Portal of Plattsmouth Bridge of the Burlington.



C., B. & Q. Ry. Standard Live Loads and Unit Stresses for Bridges.

In addition to above load use 12,500 lbs. impact load on each of four drivers on one rail = 50,000 lbs. total, and on the engine which will cause greatest stress.

WIND STRAIN.

For Lateral Systems at Unloaded Chords.—30 lbs. per sq. ft. on double the exposed area of the adjacent half of the structure.

For Lateral Systems at Loaded Chords.—400 lbs. per lineal ft. of track, considered as a moving load, and 30 lbs. per sq. ft. on that part of the adjacent half of structure not shielded by train, considered as a static load.

ALLOWABLE STRESSES (lbs. per sq. in.).

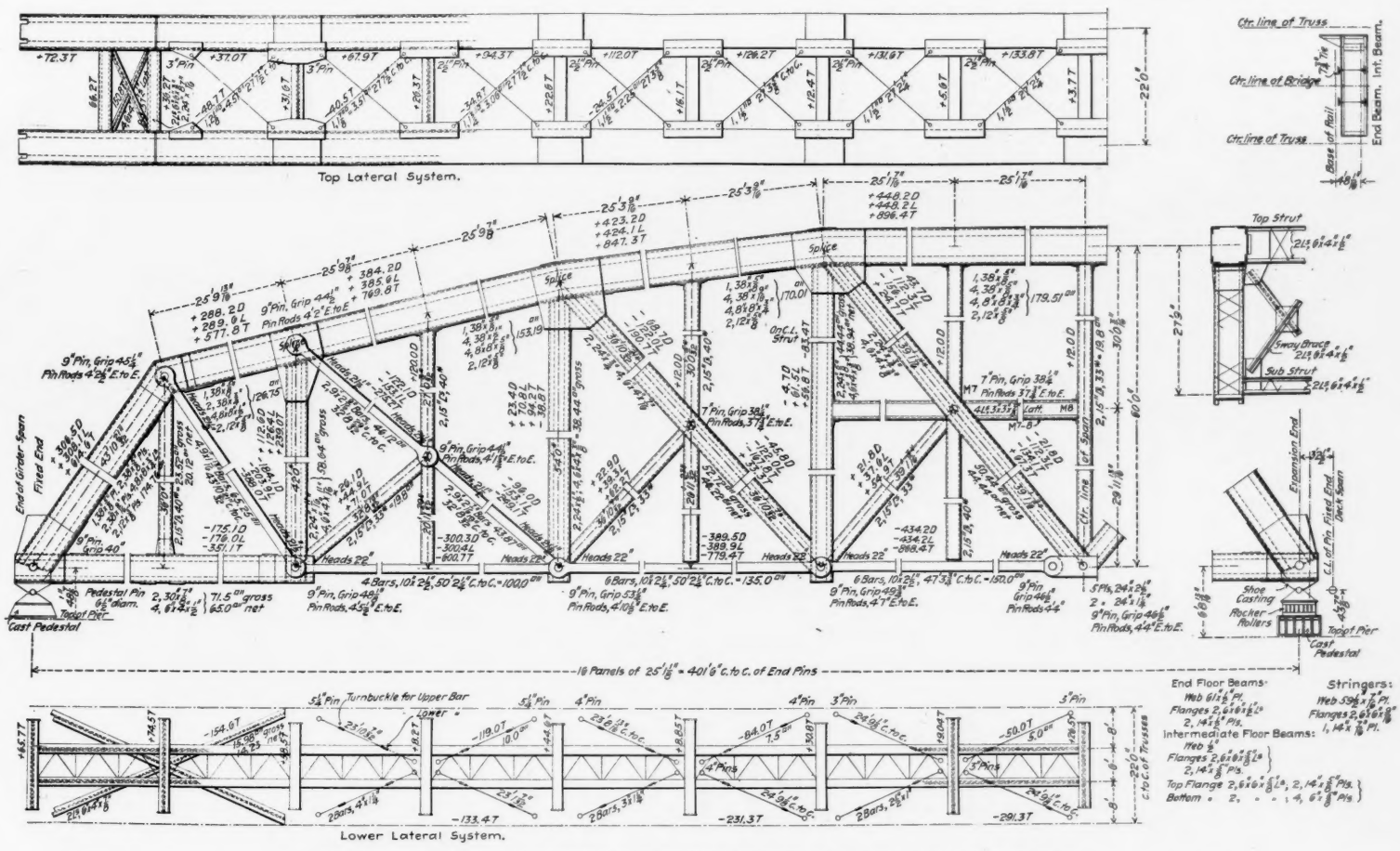
Tension—	On counters, suspenders and floor beam hangers	8000
	Other eye-bar sections	$10000\ (1 + \frac{3 \text{ min.}}{4 \text{ max.}})$
	Floor beam and stringer flanges and flanges of girders under 40 ft. in length	8000
	Flanges of girders 40 ft. long and over, and plates and shapes used in main members not above enumerated, including expansion hangers	$8000\ (1 + \frac{3 \text{ min.}}{4 \text{ max.}})$
	Plates and shapes used in wind and longitudinal bracing	20000
	Lateral and sway rods (wind and longitudinal strains)	24000
Compression—	Truss members and flanges of girders over 40 ft. long	$8000\ (1 + \frac{3 \text{ min.}}{4 \text{ max.}})$
	Floor beam and stringer flanges, and flanges of girders under 40 ft. long	8000
	Members strained by wind or longitudinal forces	20000
	All compression stresses reduced by Gordon's Formula.	
Shear—	Plates, shapes and rivets	6000
	Cast iron	3000
Bearing—	Pins in main members	$10000\ (1 + \frac{3 \text{ min.}}{4 \text{ max.}})$
	Pins in lateral and sway rod connections	24000
	Rivets	12000
Bending—	Pins in main members	16000
	Pins in lateral and sway rod connections	24000
	Plates and shapes in general	8000
	Truss members for strains due to own weight	10000
Alternate—	Eye-bar sections, stiffened	$10000\ (1 - \frac{\text{min.}}{2 \text{ max.}})$
	Plates and shapes, main members	$8000\ (1 - \frac{\text{min.}}{2 \text{ max.}})$
	Plates and shapes used in lateral systems	16000

on piling, capped, and having 2 ft. of grillage. Pier 4 was on a pneumatic caisson, carried to bed rock. The masonry of these piers showed numerous large cracks and had been reinforced for about 10 years with heavy horizontal bands. It was decided to rebuild No. 6 on a pile foundation, and to rebuild Nos. 4 and 5 on the existing foundations. They are all of concrete of the same mixture as the foundation of the new pier, No. 2½. The conditions governing the design of pier 5 were such that it was thought best to set a series of rails 15 ft. long in it, to provide additional strength against bending. They were set on end, about 4 ft. apart.

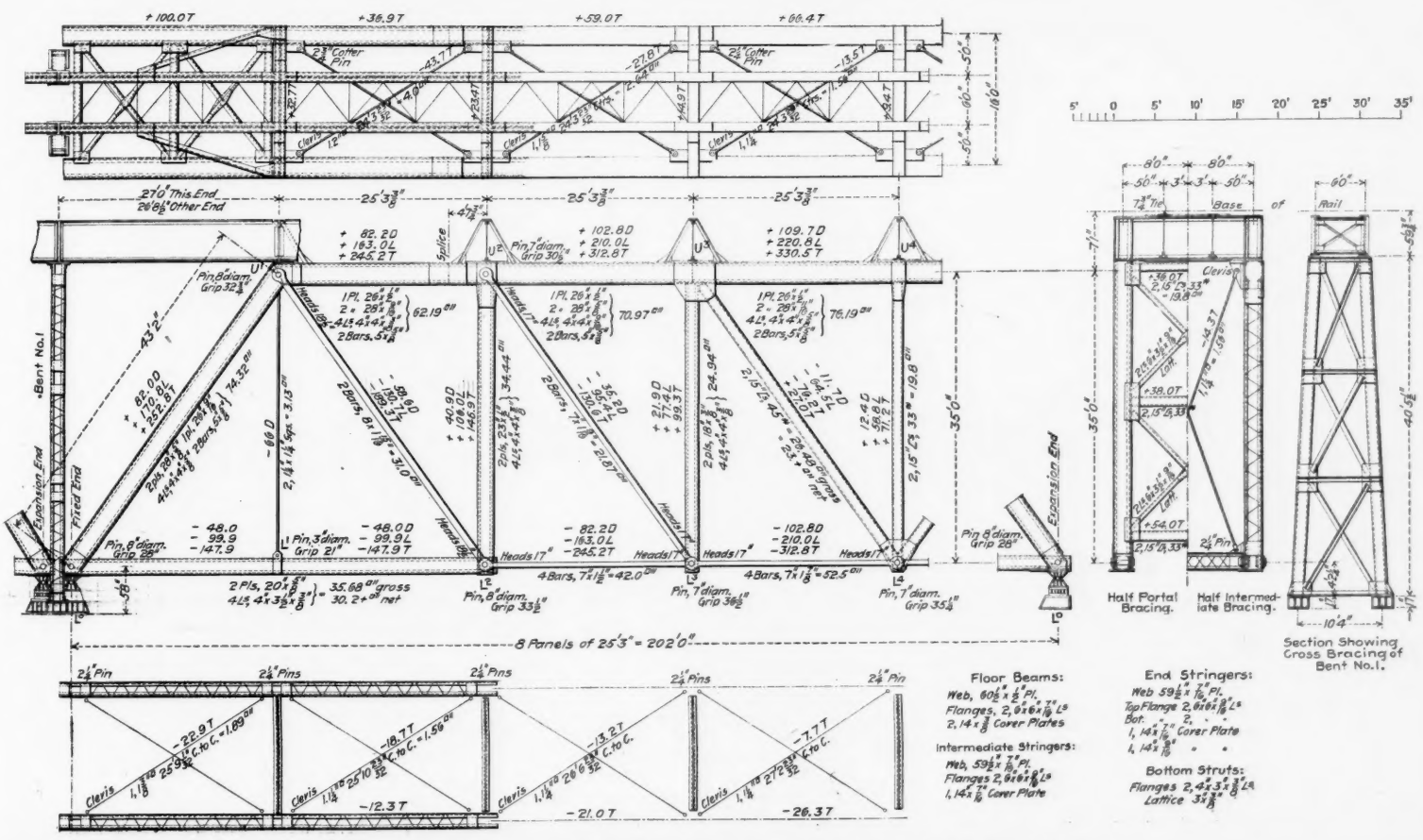
The false-work under the east 400-ft. span was designed to be wholly of piles and framed bents, but the depth of water and the absence of sand over the bed rock led to the final use of one span of Howe truss false-work adjoining pier 2. Under the west 400-ft. span the false-work was built of Howe trusses, supported on pile bents surrounded by cribs, and protected against ice and drift by triangular nosings up stream. The piles for these temporary piers were driven into mattresses of brush, sunk to the bottom with rock, as the bed rock being bare of sand, afforded no anchorage.

The 400-ft. span is designed for the standard load of the Burlington. It is of the sub-divided panel type with polygonal top chord. The secondary bracing is in the form of struts to the lower chord panels, instead of ties to the upper chord, to give greater rigidity. The lower chord is stiff for one main panel length at each end. The lower chord bars are of lengths equal to the main panels, being supported at intermediate points by extensions of the intermediate floorbeams, which latter are suspended from the intersections. These suspenders are channels, run to the top chord to give intermediate support. All sway bracing, and end lower lateral bracing, is of angles, and the interior lower laterals and all upper laterals are of bars and rods, adjustable. There are no adjustable members in the trusses, counter-stresses being provided for by making the main diagonals stiff. The 200-ft. spans are simple Pratt trusses, without adjustable bracing except in the lateral systems. The floor rests on the top chord.

The west approach consists of two 45-ft. deck-girder spans and a 30-ft. tower, and the east approach is a 90-ft. deck girder. An unusual detail in the latter is the long strut from the girder to the foot of the trestle to take up the longitudinal stress. The general designs of the work were under the direction of Mr. Edward J. Blake, who, it will be remembered, lost his life in a collision on the Burlington last year. The work was also carried out according to plans made by him. The steel work was built by the American Bridge Company at its Detroit plant, from designs made by the railroad company, and was erected by the latter. Rebuilding the masonry and erection of the superstructure was carried out under the direction of Mr. I. S. P. Weeks, Chief Engineer of the Burlington & Missouri River. Mr. C. H. Cartlidge, Bridge Engineer of the Chicago, Burlington & Quincy, had charge of the work, and to him we are indebted for data and information.



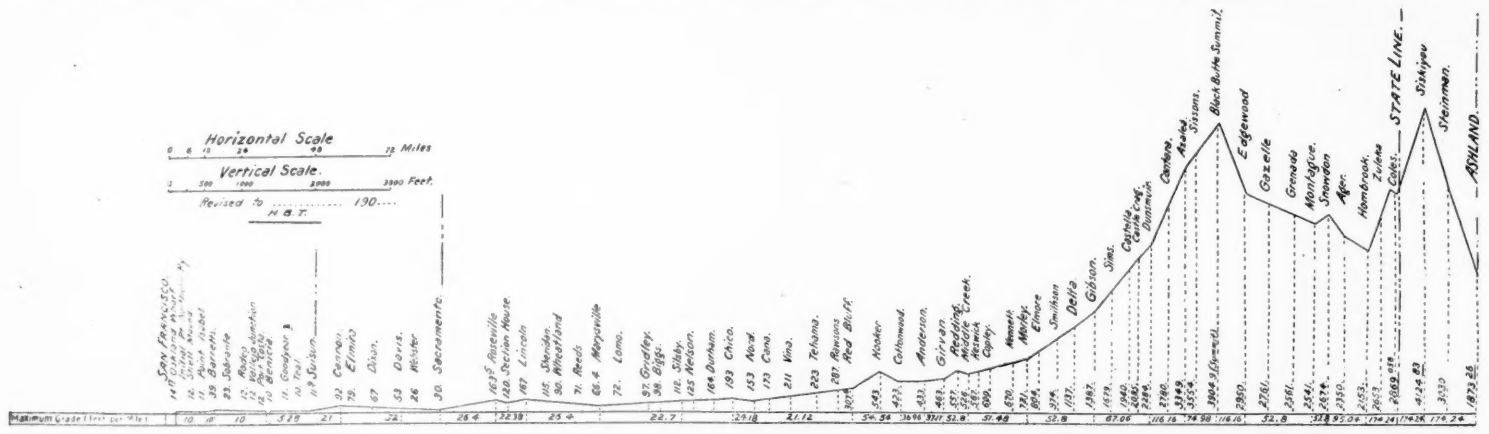
Plattsmouth Bridge of the Burlington—Erection Diagram of 401 ft. 6 in. Through Span.



Plattsmouth Bridge of the Burlington—Erection Diagram of 202 ft. Deck Truss Spans.

Air-Brakes on Mountain Grades.

The Interstate Commerce Commission has published a pamphlet containing a number of letters from railroad officials replying to a letter of inquiry sent out by the Secretary of the Commission asking for detailed information respecting their practice of handling trains on mountain grades. In view of the hearing before the commission which is held this week the following extracts are of interest as indicating the diversity of practice on different roads and the confidence or lack of confidence which



Profile of Through Line, San Francisco to Portland, Southern Pacific Company.

is placed in the air-brake for controlling long trains on steep grades.

COLORADO MIDLAND RAILWAY.

"The heaviest grade on the main line is 4 per cent. for a distance of 4.6 miles between Manitou and Cascade. Elsewhere the maximum grades on the main line do not exceed 3 per cent. Rule 41 of the Special Rules for trainmen is as follows: No train will descend any 3 per cent. grade with more than 900 tons load nor more than 40 cars. No train will descend a 4 per cent. grade with more than 750 tons' load nor more than 32 cars. Rule 44 reads: Conductors of freight trains will ride on top of cars descending 4 per cent. grades and will be held personally responsible for speed of trains on all grades. Brakemen will remain on top of cars descending grades of 3 per cent. or over, and when trains consist of 25 cars or more brakemen will ride on top of cars descending grades exceeding 1 per cent., and at such other places as the conductor may direct.

"No train is allowed to proceed eastward from Cascade Canon until it has been carefully inspected and all slack in the brake leverage taken up, worn brake-shoes replaced and cars set out which have any defects that cannot be removed while the cars are in the train. A safety spur is placed one-half mile from the head of the 4 per cent. grade and the main line switch is always set for the spur. Trains leaving Cascade are required to reduce their speed with the air-brake so that they are under full control on approaching the switch.

"It is customary on this line, where the hand-brakes work in conjunction with the power-brakes (and all Colorado Midland cars are so equipped) to take up the slack in the hand-brake after the air has been set so that while the air-brake is released for the purpose of recharging the hand-brakes will aid the retaining valves in controlling the speed of the train during such period of release."

C. H. SCHLACKS,
General Manager.

"We much prefer to have the brake-shoe working moderately on every wheel than to have some in idleness and others overworked. The water brake is not efficient or effective at high speed. It generates heat too rapidly where the speed exceeds 15 or 18 miles per hour.

"Where hand-brakes are used to hold trains and the air held in reserve to be used in assisting to stop or in cases of emergency the air-brake conditions will, as a rule, be bad. No dependence will be placed on it. Enginemen will handle their trains poorly and be unreliable when braking on grades. The best practice on mountain grades is to depend on the air-brake pressure to control the train. The pressure must be high enough to give the required brake cylinder pressure to hold the train and have a good margin still left over in the auxiliary reservoir with which to make stops. If the retainers and retainer connections are kept air tight it is not necessary to use hand-brakes while recharging."

J. W. HARDY,
Traveling Engineer.

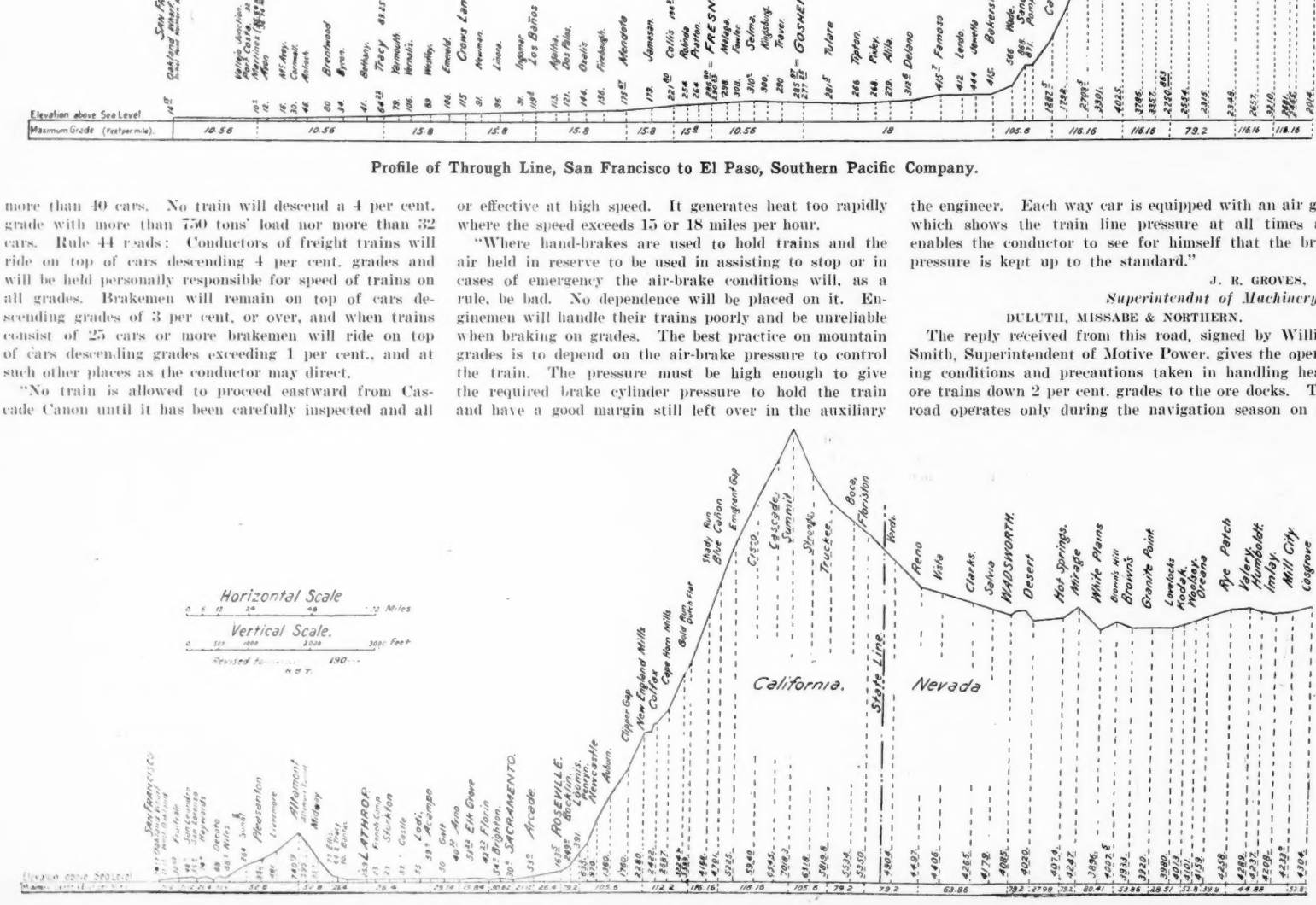
"All Colorado Midland engines are equipped with 42,000 cu. in. main reservoirs and 9½ in. air pumps. The driver brakes on all locomotives are independent and are used simply for the purpose of controlling the speed of the train while the train brakes are released for the purpose of recharging.

"The trains on the Jerome Park branch, which has 4 per cent. grades, are handled without the aid of hand-brakes. A number of through trains are also handled on the 4 per cent. grade on the main line without aid of hand-brakes. When trains are handled without the aid of hand-brakes and at all times when descending grades of 3 per cent. or over the brakemen are in their proper positions on top of the cars and are expected to render prompt assistance in case they are called on to do so by the engineer. Each way car is equipped with an air gage which shows the train line pressure at all times and enables the conductor to see for himself that the brake pressure is kept up to the standard."

J. R. GROVES,
Superintendent of Machinery.

DULUTH, MISSABE & NORTHERN.

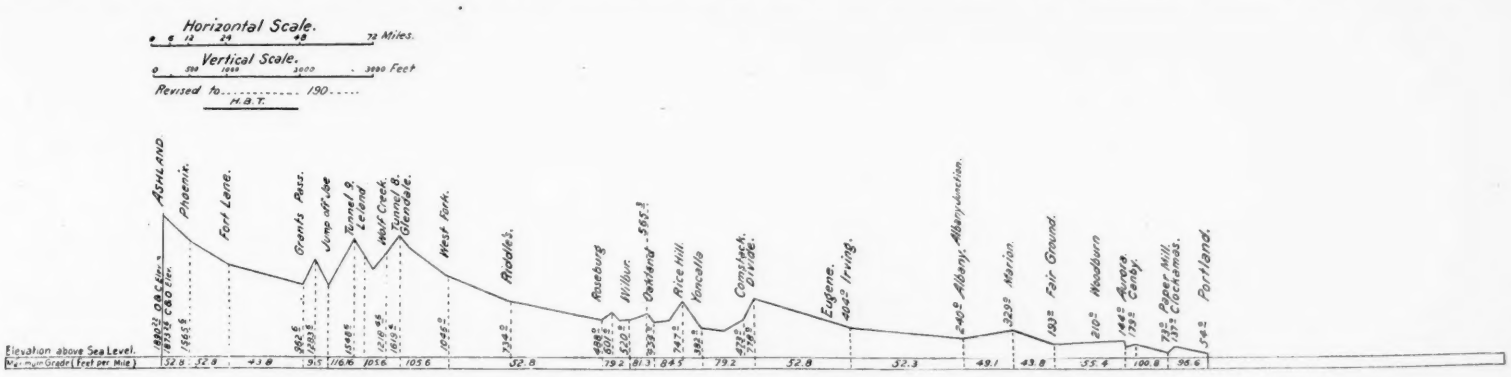
The reply received from this road, signed by William Smith, Superintendent of Motive Power, gives the operating conditions and precautions taken in handling heavy ore trains down 2 per cent. grades to the ore docks. This road operates only during the navigation season on the



Profile of Through Line, San Francisco to El Paso, Southern Pacific Company.

Profile of Through Line, San Francisco to Ogden, Southern Pacific Company.

Great Lakes and hauls ore exclusively. Trains are made up of from 55 to 70 cars and brought from the mines to Proctor, seven miles from the ore docks, with road engines. They are then turned over to a hill engine which takes the cars to the ore docks down a 2 per cent. grade and returns with empties. The trains are all carefully inspected and charged with air at Proctor and are then taken down the hill under the control of the air-brakes alone. After leaving Proctor the engine is worked under steam until about three-quarters of the train is on the grade. The balance is then allowed to run on to the grade and the whole train started down at a speed of about 12 miles per hour with all the retainers turned up. The first application is a reduction of 12 lbs., after which the engineer's valve is turned to full release and the train recharged as quickly as possible. It is then allowed to drift until it gains speed. Whenever the speed commences to gather under the pressure of the retainers, another light application is made and the train kept under control. From 12 to 14 applications are made in going down the hill and all of the reductions are small. If a leaky train is being handled the speed is reduced and a stop is sometimes made to recharge.

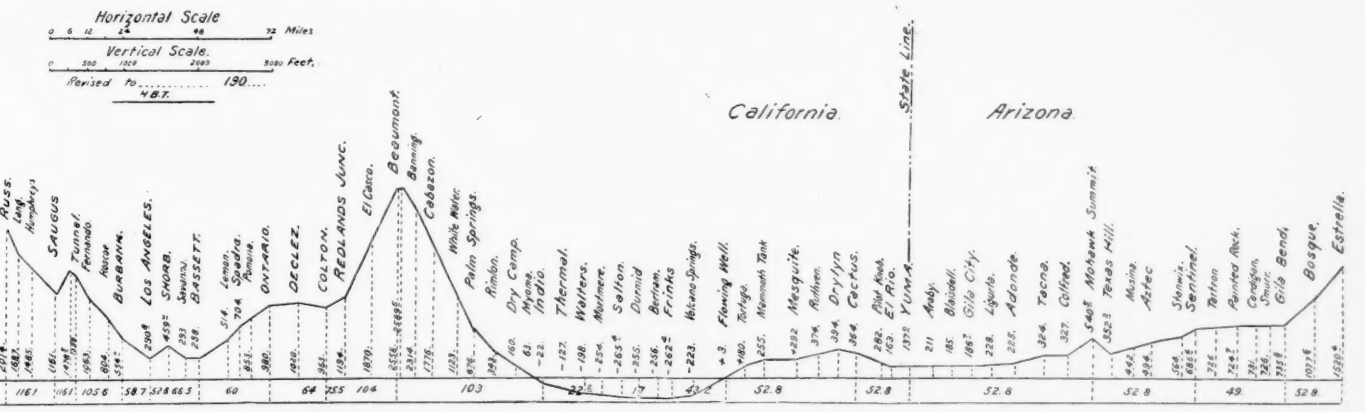


Profile of Through Line, San Francisco to Portland, Southern Pacific Company.

The profile maps shown herewith give the heaviest grades on the various divisions of this road. H. H. Forney, Master Mechanic, gives some of the instructions to trainmen and data concerning the operation of trains over the worst of these grades. The division over the Sierra Nevada mountains requires the use of the heaviest engines. Coming west, the train is made up at Truckee, usually for two Class F E engines weighing 256,000 lbs. empty, including tender, with 181,000 lbs. on the drivers. The tonnage rating per train is 1,100 tons. One of the engines is put ahead of the train and the other between the last car and the caboose. On arriving at the summit the rear engine is taken off and put on ahead of the train for the descent. On leaving the summit the grade is 116 ft. per mile. The retainers on all cars are turned up and the train controlled entirely by the air-brakes. No brakes are set and it is not the intention that they should be except in cases of emergency when the engineer will call for them. There is a standing order at Truckee that no car must leave that point without having the brakes operative. The limit to the number of cars descending this grade is 35. More than that Hornbrook, a distance of 19 miles at 174 ft. per mile, three engines are used, two ahead and one between the caboose and last car. In going down the other side all three engines are put at the head end. On this grade, 80 lbs. of air is used and the train controlled by the head engineer with no assistance from hand-brakes at any point. It is considered a disgrace among the engineers on these heavy grades to have hand-brakes set on the train which they are handling.

SOUTHERN PACIFIC.

The profile maps shown herewith give the heaviest



Profile of Through Line, San Francisco to El Paso, Southern Pacific Company.

grades on the various divisions of this road. H. H. Forney, Master Mechanic, gives some of the instructions to trainmen and data concerning the operation of trains over the worst of these grades. The division over the Sierra Nevada mountains requires the use of the heaviest engines. Coming west, the train is made up at Truckee, usually for two Class F E engines weighing 256,000 lbs. empty, including tender, with 181,000 lbs. on the drivers. The tonnage rating per train is 1,100 tons. One of the engines is put ahead of the train and the other between the last car and the caboose. On arriving at the summit the rear engine is taken off and put on ahead of the train for the descent. On leaving the summit the grade is 116 ft. per mile. The retainers on all cars are turned up and the train controlled entirely by the air-brakes. No brakes are set and it is not the intention that they should be except in cases of emergency when the engineer will call for them. There is a standing order at Truckee that no car must leave that point without having the brakes operative. The limit to the number of cars descending this grade is 35. More than that cludes the general instructions covering air-brake maintenance and application on mountain grades. The Northern Pacific uses the water brake to assist in controlling the train when recharging. The report also includes a record of tests made on a heavy mountain grade, to determine the value of the water brake.

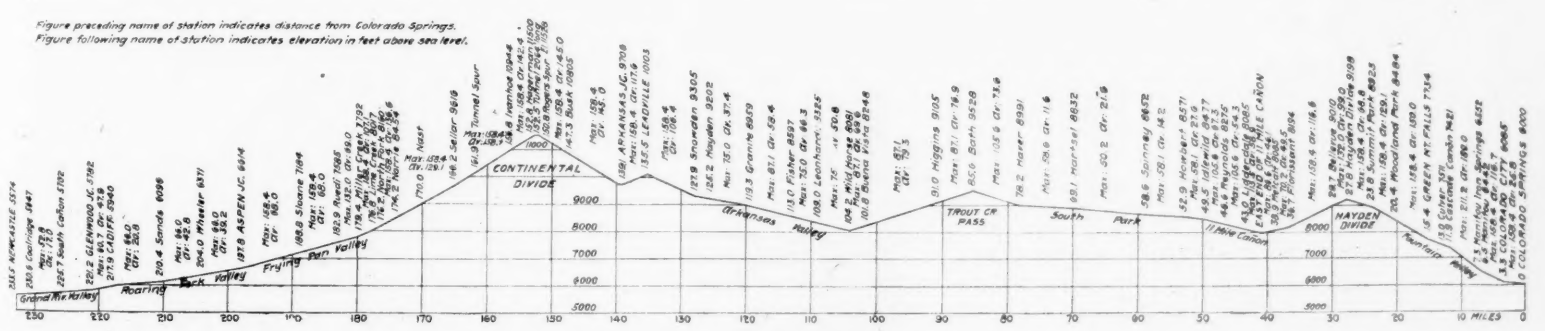
BURLINGTON & MISSOURI RIVER.

"The tonnage of freight trains on what is known as prairie or perfectly level country is 1,500 to 2,500 tons, according to the capacity of the engines. The air-brakes are kept in as perfect condition as possible and all or practically all of the air-braked cars in the trains regardless of the number are operated at all times. In some cases as many as 100 cars of air in one train have been operated with good success. On the mountain grades through the Black Hills where there are several 3 per cent. descending grades, the tonnage rating ranges from 180 to 315 tons, according to the class of engines. The speed limit is 15 miles per hour down grade on account of extreme curves; in some instances 36 deg. On nearly all of the 3 per cent. grades hand-brakes are applied before starting to descend, to assist the engineer in controlling the train to the 15 mile per hour limit. All passenger trains are equipped with the high speed brake and are not limited in any way as to speeds."

J. B. ROACH,
Air-Brake Inspector.

London Electric Tramways.

The position of electric traction in relation to the tramways in London has reached an interesting stage, which deserves attention at the present moment. In the south of the metropolis the London County Council has acquired possession of practically all the tramways, either under the purchase clause of the Tramways Act, 1870, or by agreement with the proprietary companies, and the lines are now being worked by that body. As is well known, the Westminster-Tooting line and certain other sections have recently been converted to the conduit system of electric traction, and have been in operation for about two months with results which, generally speaking, have been satisfactory from an operating point of view. Indeed, it is noteworthy that even during the recent heavy storm of rain—the most severe for many years past—there was practically no interference with the traffic, thus showing the excellence of the arrangements for the drainage of the conduit. As far as the financial side of the question is concerned, the assumption has been made in interested circles in the past that the working expenses would not exceed 6d. per car mile, and that the receipts would average 12d. per mile, leaving a balance of 6d. On this point the comptroller informed the County Council some time ago that unless a profit of 6d. net per mile was earned there would not be sufficient to pay interest and sinking fund charges. So far, however, as has been ascertained from the experience gained with the electric cars during the past two months, the receipts have averaged, according to official statements, 15d. per mile; and if the earlier assumption as to the cost of working expenses, interest, and redemption fund charges are correct, and the income is maintained at the present average, the prospect is hopeful that the undertaking will prove a commercial success. Nevertheless it is as yet too early to form a definite opinion on the subject or as to whether the large expenditure incurred in installing the conduit system will eventually be justified.



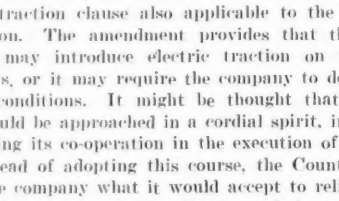
Condensed Profile of the Colorado Midland Railway.

In the meantime attention may be directed to the position of affairs on the northern side of the River Thames, where an extraordinary situation has been created owing to a variety of causes, and where a deadlock has occurred in the matter of introducing electric traction. As will be remembered, the tramways in the north were compulsorily purchased several years ago by the London County Council, which leased them to the North Metropolitan Tramways Co.—the former owner—for a period of years expiring in 1911. A clause was inserted in the lease which provided for the substitution of electric for horse traction, but a year elapsed before the County Council discovered that the clause only applied to the particular lines of the North Metropolitan Tramways Co., which are situated outside the county of London, and it was not until 1900 that an amendment of the Act which sanctioned the lease was obtained, so as to render the electric traction clause also applicable to the tramways in London. The amendment provides that the County Council may introduce electric traction on the leased tramways, or it may require the company to do so under certain conditions. It might be thought that the company would be approached in a cordial spirit, in the hope of securing its co-operation in the execution of the work, but, instead of adopting this course, the County Council asked the company what it would accept to relinquish its lease. Not unnaturally the directors of the company replied that they were not prepared to consider the question of surrendering the lease, and the matter remained in a stationary condition for some time. A few months ago, however, the County Council served notice upon the company of the former's intention to put into force the powers conferred in regard to the substitution of electric traction, and negotiations on the subject have since then been proceeding between the two parties, with the result that a selection has been made of a number of routes of a total length of 26 miles for the conduit system in the more central parts, and of 28 miles for the overhead trolley system in the more distant parts of the North Metropolitan tramway network.

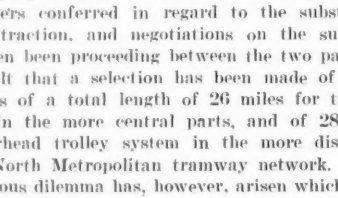
A serious dilemma has, however, arisen which threatens to retard the conversion to electric traction of any of the tramways on the north of the Thames. In the first place, the borough councils as the road authorities, and having the right of veto, are opposed to the overhead wires, and the more so as they have seen the advantages of the conduit system in South London, whilst the government would not allow of the employment of the single overhead trolley with rail between in certain parts of the East End of London owing to the possibility of disturbances being produced at the Greenwich Observatory. On the other hand, the North Metropolitan Tramways Co. is in favor of the overhead trolley method and would assist in its introduction. In fact, the company is said to be of opinion that if the County Council would help, the veto of the borough councils would be overcome—or perhaps it would be better to term it overridden—and the work carried out at once; but the County Council is naturally not disposed to embark upon a risky venture which might lead to long and costly litigation. The company is, however, not only strenuously opposed to the introduction of the conduit system, but it points out that under the terms of its lease it is entitled to "quiet enjoyment," and the possibility exists that any attempt to lay down the conduit method while the company is in possession would involve the County Council in heavy compensation. It remains to be seen whether an outlet from the present difficulty will be found, but so far as can be concluded from the situation of affairs, the deadlock will probably continue for a long time to come.—*The Engineer* (London).

Insulated Rail Joints for Track Circuits.

The accompanying illustrations show an insulated rail joint made by the G. L. H. Rail Joint Co., of 150 Nassau street, New York. The angle chair runs the entire length



of the joint, gives base support for both rail ends, has special outside spiking facilities and an equal distribution of the base supporting plate in reference to the rail base. A solid steel inside strap and interchangeable wood fillers run the length of the joint, the various parts are insulated from each other and the rail ends, where neces-



sary, by the use of hard fiber in addition to wooden blocks.

There is also shown an insulated rail joint for service in sidings and cross-overs and tracks not used for heavy running. Wood blocks and solid steel straps run the entire length of the joint, both inside and outside, the straps giving necessary tensile strength and preventing the wood fillers from pulling apart. The only fiber insulation needed in addition to the end posts in a joint of this design are the bolt bushings and washers.

This company is also making insulated rail joints in which the receiving rail rests directly on the metal base plate, thus reducing the wear on the fiber parts and lengthening the life of the joint.

The Machine Shop Problem.*

. . . We usually find a marked contrast in the general efficiency of the several departments of a business. The management, as a rule, devotes much of its time to the development of lines for which it has a particular taste. . . .

The buildings, which should be secondary to the equipment, are usually designed and built without proper consideration of the work in view. The shop architect cannot lay out buildings unless familiar with the work. The location of the machines, the system of power transmission, and innumerable other details, materially affect the design. . . .

The success of one plant, as compared with another engaged in the same line of work, depends upon the balance of the efficient and inefficient departments. . . . The majority of establishments excel in but a few of the branches of the business.

It is for this reason that an engineer making a study of this work can frequently detect the weak points, the system of fundamental analysis being more powerful in the hands of one who has not been in close association with the work. The condition of affairs can hardly be illustrated better than by quoting from an editorial in one of the technical papers about a year ago, which said that "many engineers suffer from using lenses of too high power and too narrow a field; in such matters the telescope is sometimes of as much value as the microscope. . . ."

Graphical presentation of complex problems facilitates a study of the various elements. While in many cases only "relations" can be expressed in this way, yet the mind can grasp the problem quicker than by any other method. . . . A lack of co-operation between the principal subdivisions of a business, results in an enormous expenditure of useless energy and money. . . . Nothing is more discouraging to an enthusiastic worker than to have schemes, which he has formulated after much thought and experiment, passed upon as good but not put into operation. . . .

Conditions are, of course, very different in different establishments. In the "tonnage" plant one man may be able to take care of all the work, carrying in his mind the entire scheme and, if he has exceptional ability in this particular field, efficient results are likely to follow. When the work is complex in character, however, it must be subdivided among a number of men, it being ever borne in mind that the first essential to success is thorough co-operation between the various departments. . . .

The chart shown in Fig. 1 subdivides the production department into the buildings, equipment, etc., each of these details being further analyzed. The absurdity of spending a large amount of time and energy on any one of these details, without consideration of the others, is self-evident when presented in this way. . . .

Probably nothing has increased the possibilities of the machine shop to a greater degree than the power crane, and although the designer of the building is always informed, in a general way, as to the crane service that will be required, this detail is not given enough consideration. . . .

The usual scheme of allotting separate sections of the side bays of a shop to different classes of work, such as lathe department, drill press department, grinding department, etc., and allowing sufficient additional space to take care of the growth of these departments, can hardly be termed good practice. Money is tied up for a number of years, which yields no return; and when the space is ultimately occupied, further extensions usually result in a most inefficient arrangement of tools. . . .

The power transmission system will influence the design of buildings. Motors on individual machines are frequently justified by the reduced first cost of buildings.

The lighting of the machine shop or foundry influences the efficiency of the men. It is impossible to get too much light, provided the direct rays of the sun do not fall on the work. . . .

The machine tool equipment should receive close study by one familiar with the latest types of apparatus. . . . Purchase of equipment is frequently left to a purchasing agent in no way conversant with the requirements, the price being his only means of comparison. . . . Some of the largest shops use a cheap grade of carbon steel for cutting tools, instead of the "air-hardening" variety which would permit of double the cutting speed. In such a plant $5,000 invested in tool steel might readily effect an annual saving on the labor bill of $15,000.

The "type of equipment" will depend upon the character of the work, and, as the province of the machine shop is radically different for various lines of work, there are no hard-and-fast rules which may be followed. The three examples given below will illustrate this point:

(1) In a rolling mill the repair-shop equipment is only used in case of break-downs, and in a number of instances special machines have been purchased for repairing single details of the equipment and which have been used but a few days in several years. This illustrates an extreme case, where it is necessary to carry a heavy investment in order to be prepared for break-downs. The equipment or management of such a shop would not greatly influence the cost of the product. . . .

(2) The work in a locomotive shop consists largely in overhauling engines at periodic intervals, so that, under normal conditions, these shops should operate at their full capacity. Special machinery can be used for a great deal of this work. . . . Economic production in this field results when the locomotives and cars are detained in the shop the least possible time, the actual saving in machinists' wages being a small item as compared with the earning power of the rolling stock.

(3) The equipment and management of a machine shop doing manufacturing work are vital factors of the organization, a slight reduction in labor cost frequently resulting in an enormous increase in business. This is particularly true of concerns making duplicate articles in large quantities, where price affects the quantity of goods sold. High efficiency usually accompanies duplication, and the only way that a low first cost may be attained, when doing work which varies in character, is by dictating to the workmen the methods of machining.

It matters little whether we turn our attention to the equipment or management. The same conditions are met, and such statements as would indicate that an organization offsets an inefficient equipment by superior management should be accepted reservedly. They are so closely related that a thorough understanding of one is not possible without knowledge of the other.

Why has shop equipment advanced so slowly and why so much doubt as to the merit of recent discoveries, such

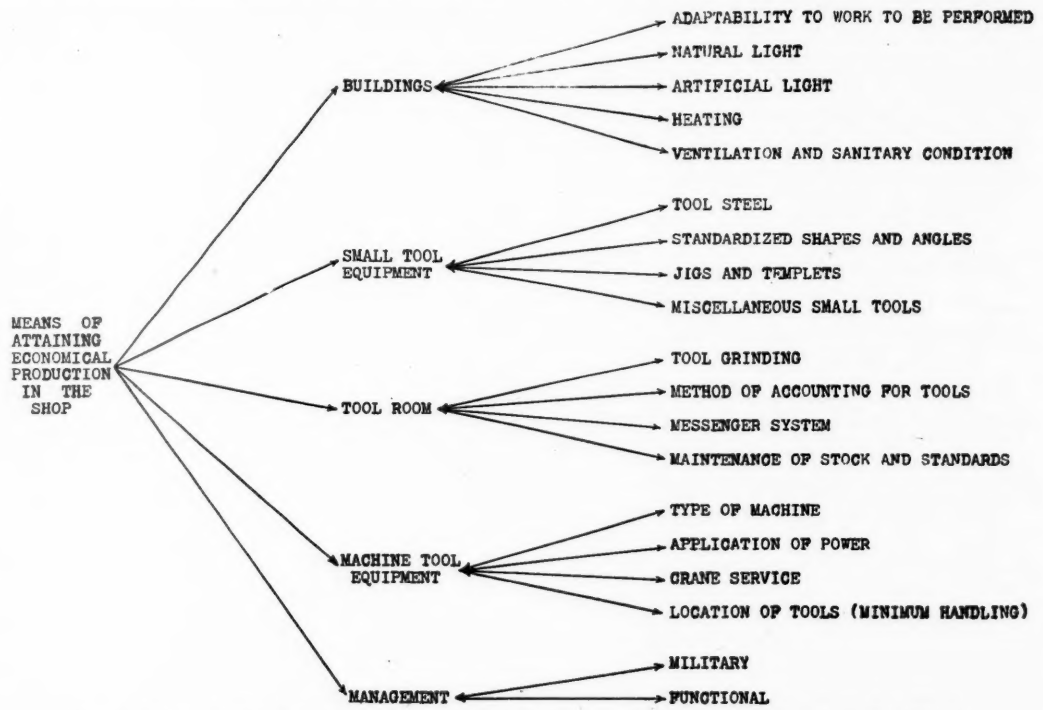


Fig. 1.—Diagram Showing Subdivisions of the Production Department of a Manufacturing Plant.

*Abstract of a paper by Mr. Charles Day, presented to the American Society of Mechanical Engineers, June, 1903.

as the high-speed tool steel and the motor drive? Simply because shop management—the vital force behind the machine—has been unable to keep pace with the development of the apparatus. . . .

Individual concerns that have developed machines possessing many refinements over those made by competitors, have found but small incentive to market such tools, prospective purchasers having neither the knowledge to appreciate or to take advantage of their possibilities in the shop. . . . In an extreme case, such as a full automatic screw machine, we might suppose that the ability of the designer would assure the success of the tool; but innumerable details arise, such as the grinding and setting of cutters, the delivery of stock to and from the machine, etc., which may or may not be efficiently taken care of by the purchaser. Turning to the other extreme—an engine lathe doing a general class of work—the workman is confronted by innumerable problems, governing economical production, which he fails to recognize. For example, the proper cutting speeds for different materials and different cuts; the relative advantage of a heavy cut at a slow speed, or a light cut at a high speed; and the capacity of the machine. These are but a few of the details. Such information can only be obtained from experimental work carried on along scientific lines. . . .

It is unfortunate that the builders of electrical apparatus are not in close enough touch with the conditions to be met. Many builders of electrical apparatus design motors which may be efficient from the standpoint of the electrical engineer, but utterly unsuited to shop requirements.

In contrast to the methods described above, we must again allude to the work of Mr. Taylor in the field of shop equipment and management. His system of management consists primarily in a planning department in which by means of information at hand, the workman is instructed, through a system of functional foremanship, as to the exact method of doing the work. This planning department bears the same relation to the shop that the draughting room does to the engineering department. This statement conveys no impression as to the vast amount of detail knowledge Mr. Taylor has accumulated and which accounts largely for his success. His methods have constantly aimed at uniformity and standardization, the Taylor-White process being but one of many examples which could be cited as the result of this work. Together with his assistants, he has obtained an enormous amount of data relative to cutting metals, which is made applicable by means of slide rules. The underlying principle of all his work, a high wage with a low labor cost, involves the keenest appreciation of the labor problem. Not a single detail of shop equipment can escape the application of the Taylor system, and it is only in this way that continued high efficiency of operation can be secured.

The small attention given to the cutting-tool in the vast majority of shops is astonishing when we realize how directly the time of machining is dependent on the character of the steel. We are all constantly hearing of phenomenal cutting-speeds, etc., but it is the efficiency of the tools in the tool racks that is a gage of their value. . . .

If a cutting tool is to work to its maximum efficiency, the cutting speed should be maintained constant for a given depth of cut and a given feed. Consequently some means should be provided for accelerating the spindle speed of a lathe when the tool is working from a larger to a smaller diameter, such as facing cylinder heads, etc. A lathe of this character may be truly termed a variable-speed machine. In the average shop, however, there is very little opportunity for work of this kind, the majority of lathe work consisting of longitudinal cuts. If the lathe operates on but one class of work, the proper spindle speeds and feeds can be obtained, which should not be changed as long as conditions remain unaltered. If, on the other hand, a great variety of work is handled by a lathe, the tool will constantly work on different diameters, variable speed being equally as important in this case as in the first considered, although a uniform increase, as the work proceeds, would not be required. Simple as this classification may seem, the electrical engineer repeatedly fails to see that a system of motor driving that would be applicable in one case utterly fails in another.

Practically all machine shops have some variable-speed tools, and here again, it is the province of the engineer to determine the relative importance of the various factors. A manufacturer who advertises a variable-speed countershaft or motor for machine-tool driving which will give any speed, shows his ignorance of shop conditions where a refinement of this kind cannot be used to advantage. In fact, after visiting practically all the shops that have installed multiple-voltage equipment offering the possibilities of close-speed regulation and ease of handling, we are convinced that the purchasers are not beginning to realize an adequate return on the investment. . . .

Classified Locomotive and Car Statistics.

The annual report of the Interstate Commerce Commission's statistical office, which was noticed in the *Railroad Gazette* June 19, page 439, and which will soon be issued in book form, contains classifications of locomotives and of freight cars showing the number of each different size and kind, with the aggregate power of the locomotives and the aggregate capacity of the cars. Engines are classified into single expansion, four-cylinder compound, and two-cylinder compound; and they are further classified according to the type. The tables which appear in the report are given herewith, slightly condensed. In the first column of the locomotive table the type of engine is shown by circles, indicating the number of pairs of wheels; large circles indicating drivers and small ones leading and trailing wheels. The locomotive is indicated as facing to the right. It will be seen that every possible wheel arrangement is represented by engines still in use, although of some types there is only a single example. Locomotives of unusual type, such, for example, as the Shay, are not included; and the total number shown in the table, 37,516, is 3,709 less than the total number reported as existing in the United States on June 30, 1902. The others are either of unusual type or they belong to logging roads or other private industries.

The totals of the locomotive table are as follows:

Condensed Classification of Locomotives.

Item.	Simple.	4-cyl. comp.	2-cyl. comp.
Number	35,228	1,175	1,113
Tractive power, lbs.	702,654,157	34,111,040	31,737,582
Grate surface, sq. ft.	869,807	50,221	41,882
Heating surface, sq. ft.	53,101,482	3,002,826	2,505,969
Wgt., excl. of tender, tons.	1,935,542	100,337	84,003
Weight on drivers, tons.	1,540,952	79,167	70,036

The three-column table showing freight cars and their capacities is self-explanatory. Classes XIII and XIV, in which there are no items, are omitted in our reprint. The total number of cars shown, 1,505,992, is 40,109 less than the total in service; that number representing cars for which complete returns were not secured.

The statistician says in the report that the classification of locomotives is experimental and he will glad to receive suggestions for its improvement.

CLASSIFICATION OF LOCOMOTIVES IN THE UNITED STATES, JUNE 30, 1902.

Class.	Number.	Tractive power. Lbs.	Grate surface. Sq. ft.	Heating surface. Sq. ft.	Weight, exclusive of tender. Aggregate. Tons.	Weight, exclusive of tender. Aver. per engine. Tons.	Wgt. on drivers. Tons.
A.—Single Expansion Locomotives.							
OO>	1,106	14,544,894	13,954	912,320	34,986	32	34,986
OOO>	3,656	73,934,950	74,699	4,677,957	174,472	48	174,472
OOOO>	115	2,464,108	2,825	154,153	6,026	52	6,026
OOOOO>	7	259,961	267	16,700	561	80	561
OOo>	112	1,382,330	1,827	107,220	4,216	38	3,090
OOOo>	4,639	96,800,555	116,409	6,897,592	257,643	56	221,269
OOOOo>	6,521	187,469,939	227,218	12,246,263	456,716	70	394,574
OOOOOo>	2	63,368	72	4,674	145	73	130
Ooo>	8	48,626	96	3,635	204	25	120
OOoo>	11,194	155,384,418	221,423	13,700,383	499,573	45	326,642
OOOoo>	6,925	145,595,658	173,022	12,142,559	426,668	62	326,309
OOOOoo>	409	13,852,398	17,102	983,329	35,159	86	28,194
oOO>	6	52,943	64	2,629	141	24	123
oOOO>	6	89,000	119	7,143	326	54	275
oOo>	1	2,186	9	115	13	13	13
oOOo>	17	192,015	261	17,418	664	39	463
oOOOo>	90	2,168,644	3,570	240,656	7,281	81	5,458
oOOOOo>	1	25,769	28	2,083	84	84	68
oOOoo>	288	6,555,732	14,107	848,250	23,868	83	13,831
oOOOoo>	3	84,750	130	8,771	255	85	174
ooOO>	22	192,881	279	13,736	716	33	481
ooOOo>	55	648,880	885	45,478	2,653	48	1,562
ooOOOo>	9	160,700	170	9,418	538	60	336
ooOOOoo>	1	18,745	17	1,115	68	68	31
ooooOo>	5	42,783	75	3,735	249	50	142
oooOOo>	10	165,730	230	12,508	830	83	360
oooOOOo>	20	452,194	949	41,642	1,487	74	1,262
B.—Four-Cylinder Compound Locomotives.							
OOo>	1	9,140	16	466	58	58	40
OOOo>	123	3,542,249	4,930	283,394	9,933	81	8,425
OOOOo>	419	15,362,990	17,090	1,078,719	37,864	90	33,304
OOOOOo>	10	467,348	750	33,990	1,097	110	962
OOoo>	67	946,778	3,737	96,129	3,954	59	2,641
OOOoo>	380	9,952,299	14,888	992,957	31,956	84	24,035
oOOOo>	91	2,421,000	4,692	327,694	9,243	102	6,349
oOOOOo>	1	17,326	56	2,332	78	78	60
oOOoo>	73	1,314,070	3,888	181,810	5,774	79	3,106
ooOO>	10	77,840	174	5,335	380	38	245
C.—Two-Cylinder Compound Locomotives.							
OOO>	27	672,342	686	40,077	1,568	58	1,568
OOo>	1	15,289	23	1,508	55	55	35
OOOo>	109	2,898,162	2,853	187,288	7,004	64	5,940
OOOOo>	554	17,541,830	23,660	1,269,924	42,724	77	37,972
OOoo>	19	232,452	298	19,757	744	39	488
OOOoo>	300	7,420,369	10,644	728,788	23,560	79	17,505
OOOOoo>	75	2,373,899	2,572	187,492	6,205	83	5,093
oOOOo>	16	401,534	788	51,600	1,533	96	1,064
oOOoo>	6	131,923	255	15,978	449	75	250
ooOO>	6	49,782	103	3,557	161	27	121

CLASSIFICATION OF FREIGHT CARS IN THE UNITED STATES, JUNE 30, 1902.

Item.	Class I. Capacities in the 10,000's of pounds.	Class II. Capacities in the 20,000's of pounds.	Class III. Capacities in the 30,000's of pounds.	Class IV. Capacities in the 40,000's of pounds.	Class V. Capacities in the 50,000's of pounds.	Class VI. Capacities in the 60,000's of pounds.	Class VII. Capacities in the 70,000's of pounds.	Class VIII. Capacities in the 80,000's of pounds.	Class IX. Capacities in the 90,000's of pounds.	Class X. Capacities in the 100,000's of pounds.	Class XI. Capacities in the 110,000's of pounds.	Class XII. Capacities in the 120,000's of pounds.	Class XV. Capacities in the 150,000's of pounds.	Total. Classes 1 to XV.	Average capacity, in tons.
Box cars, number	615	6,426	27,364	170,178	97,874	355,391	8,112	37,432	2	5,467	...	...	..	708,861	..
Aggregate capacity, tons	4,723	78,166	412,369	3,410,956	2,446,883	10,643,368	283,920	1,497,280	90	273,350	...	...	..	19,051,105	27
Flat cars, number	387	4,174	8,670	43,836	23,602	41,895	6,793	9,180	1	3,750	4	9	2	142,303	..
Aggregate capacity, tons	2,545	49,030	130,307	876,583	590,409	1,256,554	238,218	367,200	48	187,500	220	540	150	3,699,304	26
Stock cars, number	110	518	3,078	19,143	13,825	20,657	1	336	..	...	...	...	..	57,668	..
Aggregate capacity, tons	826	5,661	46,294	383,685	345,979	620,265	35	13,440	..	...	...	...	..	1,416,185	25
Coal cars, number	2,688	1,895	4,792	81,601	95,963	199,389	5,760	105,185	202	36,554	385	34	..	534,448	..
Aggregate capacity, tons	14,130	22,043	73,383	1,634,163	2,400,533	5,990,792	201,560	4,235,455	9,340	1,827,700	21,175	2,040	..	16,432,314	31
Tank cars, number	...	595	113	308	310	956	5	755	..	491	...	...	..	3,533	..
Aggregate capacity, tons	...	7,503	1,942	6,160	7,752	28,680	170	30,200	..	24,550	...	...	..	106,957	30
Refrigerator cars, number	3	79	178	4,710	4,700	8,434	113	...	5	...	...	...	..	18,222	..
Aggregate capacity, tons	27	992	2,675	94,200	117,707	252,854	3,955	...	225	...	...	...	..	472,635	26
Other cars, number	1,319	1,928	2,158	7,566	10,410	7,904	1,709	5,291	100	2,572	...	...	..	40,957	..
Aggregate capacity, tons	8,142	20,858	32,514	151,412	260,264	236,732	59,815	211,640	4,500	128,600	...	...	..	1,114,477	27
Total, number	5,122	15,615	46,353	327,342	246,684	634,626	22,493	158,179	310	48,834	389	43	2	1,505,992	..
Aggregate capacity, tons	30,393	184,253	699,484	6,557,159	6,169,527	19,029,245	787,673	6,355,215	14,203	2,441,700	21,395	2,580	150	42,292,977	28
Average	6	12	15	20	25	30	35	40	46	50	55	60	75	28	28

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

CONTRIBUTIONS.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussion of subjects pertaining to ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

The Latest Northern Securities Co. Decision.

On August 1, 1903, Judge Lochren, of the United States Circuit Court, decided the case of the State of Minnesota against the Northern Securities Co. and others, in favor of the defendants, and dismissed the bill of the complaint of the State.

The action was brought by the State authorities for the purpose of having it declared that the Northern Securities Co. in acquiring control of the Great Northern and the Northern Pacific had violated the law of Minnesota of 1874, which forbids the consolidation of parallel railroads, and also the anti-trust law passed by the State Legislature in 1899, forbidding combinations in restraint of trade or commerce between the State of Minnesota and other States. The theory, therefore, upon which the State authorities proceeded was twofold: First, that the Northern Securities Co., while in form a mere corporation chartered by the State of New Jersey for the innocent purpose of dealing in stocks and bonds, was in reality a device for the purpose of consolidating parallel lines in the State as well as a combination for the purpose of restraining trade between the State of Minnesota and other States.

Some time before the suit which has just been decided, the State of Minnesota had exercised its high prerogative of appealing to the original jurisdiction of the Supreme Court of the United States, and had brought an action there against the Securities Co., on the ground that it had violated the State law prohibiting a consolidation of competing lines. The Supreme Court dismissed the suit on the ground that the necessary parties to decide the action were not before the Court, but did not pass upon the merits of the controversy. In the light of this decision, the State began the present suit upon substantially the same lines, but in a different federal court, bringing in the necessary parties that had been omitted in the previous suit and thus obviating the previous objections, so far as it appears, quite thoroughly and satisfactorily to the Court.

Judge Lochren does not place his decision upon preliminary technical matters. He examines all the evidence which was taken by both sides to ascertain the facts and circumstances in connection with the formation of the Securities Co. So far as we are informed, the facts in this suit were shown to be substantially the same as those in the action taken by the Government of the United States against the railroad merger before the Special Circuit Court which was organized under the Act of Congress approved Feb. 11, 1903.

The Federal action decided in April, 1903, at St. Louis was brought under the Sherman Anti-Trust Act of 1890, for the purpose of having it adjudged that the railroad merger was forbidden by the Sherman law against contracts, combinations and conspiracies in restraint of interstate commerce. The issue in the federal case was whether the Securities Co. was a combination to monopolize, in part, interstate commerce or whether it was a trust in restraint of trade between the States as forbidden by the Sherman law.

The issue in the Minnesota case was first, whether the Railroad Merger was a violation of the State law against consolidation of parallel lines, and second, whether it was a violation of the State anti-trust law. In the latter branch of the case, the issue between the parties in the federal case and that between the parties in the State case were substantially identical.

The State Anti-Trust Act is much the same as the Sherman Law, after which quite all of the State laws have patterned.

The new question in the case before Judge Lochren was whether the merger violated the State law against railroad consolidation. He might have decided this question in favor of the Securities Co., but it was supposed he could not decide the other question in the case, without conforming to the previous case in the Special Federal Court.

To understand the situation, it is necessary to refer to an unwritten law amongst the lawyers to which they all show great respect, and from which they do not depart without explanation or palliation. We refer to the law of authority, which is embalmed in the old-time adage amongst the lawyers: "Stand by the decisions." These learned gentlemen make a distinction among authorities; some they regard as controlling, others as merely persuasive. A decision of the highest Court in the State upon the exact point in question in a lower court is controlling upon the lower court; while a decision in the highest court or any other court of a sister State is merely persuasive; the persuasive effect depending upon the rank of the court, and its reputation for learning and accuracy in expounding the law.

The decision of the Supreme Court of the United States is controlling upon every Federal Court of lower degree; but a decision of a Circuit Court in one circuit is not controlling upon a Circuit Court in any other circuit of the United States, but it is persuasive. Each co-ordinate court, or each subordinate court in different circuits, having the right to decide differently, the same question, it sometimes happens that decisions upon certain questions in one federal circuit vary from those on the same question in other circuits. The law is thus unsettled until the question is passed up by the court of last resort, when it is forever settled, unless that court should subsequently reverse itself, which is rarely done. Judge Lochren presided in this case as the Circuit Court of the United States. The judges that constituted the extraordinary court at St. Louis, and decided the previous federal suit against the Securities Co., have appellate jurisdiction over his court, and, therefore, the decision in that case would under the rule have been controlling upon Judge Lochren. He had the right, perhaps, to disregard a precedent that under the rule was binding upon him, and to examine the question for himself, and reach, if he was so minded, a conclusion different from the august tribunal which decided the previous case. And this he has actually done. But such a course is so unusual as to add another novelty to the interesting litigation over the merger.

After stating that he had given the case most careful consideration, he announced that he has reached the conclusion that none of the defendants have violated the Minnesota Anti-Trust or Anti-Consolidation Act. He concedes that this conclusion is apparently contrary to that reached in the previous federal case by the four judges who will ultimately, at least in part, sit in review of his own decision. Having the legal right to depart from the conclusions previously reached by them, his own deliberations have convinced him that they are in error, and he does not hesitate to say so unequivocally. He epitomizes the previous decision as establishing the doctrine that a "person can be held to have committed, or to be purposing and about to commit a highly penal offence, merely because it can be shown that his pecuniary interests will be thereby advanced, and that he has the power either directly by himself, or indirectly through persuasion or coercion of his agents to compass the commission of the offence." In other words, he claims that the previous case decided that an opportunity to commit an offence was proof of its commission, which doctrine he rejects.

This pungent epitome of Judge Lochren puts the learned Court, constituted by four judges of unusual ability, in such a ridiculous position, that one without examining that position for himself would conclude from the nature of things that Judge Lochren must himself be, at least to some extent, in error; and a careful examination of the case which he criticizes will show that he is quite wrong in stating the effect of the previous decision. The Court in that case was pronouncing its judgment upon all the facts and circumstances of which the incorporation of the Northern Securities Co. was merely one, though the important result of many others. Their judgment expresses the opinion of the Court on the meaning of all these facts and circumstances—what they were all designed to lead to, and what they all actually did lead to; and the Court found that they all meant, and that they were all intended to mean, a combination to restrain commerce between the States.

In reaching an adverse conclusion, Judge Lochren seems to have regarded principally, if not alone, the mere incorporation of the Securities Co., and upon that limited inspection, he finds little to suggest combination or conspiracy in restraint of trade. He leaves out of view, apparently, the numerous conferences, meetings and agreements between individuals and the corresponding official corporation to obtain a certain purpose and the actual attainment of the purpose sought. If these matters are entitled to no weight, Judge Lochren seems to be right, and his fellow judges wrong; but if such matters materially bear upon the question whether a combination existed to restrain trade, they may be right and he is probably wrong.

It seems to us Judge Lochren has been misled by considering the question before him to be whether the defendants had actually restrained trade, instead of whether the defendants had formed a combination to restrain trade within the meaning of this phrase as held by the Supreme Court. Both the restraint and the combination to restrain were forbidden by the statute, and the defendants could not avoid condemnation by showing that they had merely formed a combination to restrain, but had not actually restrained. Perhaps we are not in a position to comment upon the unusual course that Judge Lochren takes in departing from an authority so august as the Court whose decision he criticizes so frankly; but on the whole we think it would have been more consonant with good precedent for Judge Lochren to have bowed to the unanimous decision of the four judges that sat at St. Louis, and to have regarded their decision as binding on him, though he may have expressed his dissent from it.

It is good policy to adhere to a rule when it is once established, leaving it to the Court of last resort to say whether on the whole the rule should be finally approved or not.

Little is gained by inferior courts deciding questions adversely to previous decisions, to which we should all bow. The moral effect of a dissent is heightened rather than lost, by a dignified acquiescence in that which has been decided, because it has been decided. We are trying in this country to approximate the reign of law and order. Any other course leads to refractory confusion and hopeless disorder.

The St. Louis decision has been often and bitterly assailed, and quite as often enthusiastically supported. But we should remember that it was the unanimous conclusion of four learned and able judges, after hearing an exhaustive argument by counsel for both sides.

Some of the objections to the success of the Government seem strong as well as novel, but the strong objections appear to have been already passed upon by the Supreme Court of the United States, and the novel ones lack strength, if for nothing else than that no one has thought of them before. The most formidable difficulty the defendants are likely to meet in the way of their success in the Supreme Court is that their best arguments, from an economic and commercial standpoint, have already been heard, and overruled, by that Court.

The probabilities are, of course, overwhelming that the Court will adhere to its previous decisions under the Sherman law, and the only way out that we think is now open to the Securities Co. is to show the Court that all the facts and circumstances connected with the organization of the company establish neither an actual restraint of trade nor a combination to restrain it.

The Noise Nuisance.

According to the Boston *Advertiser*, the Boston Elevated has succeeded in reducing by 25 per cent. the noise made by trains, on its elevated structure. Among other things which have contributed to this reduction of noise, mention is made of the use of a leather link connecting the contact shoe with the car. The tires of the wheels are periodically ground to remove flat spots. A year ago an officer of the company made a study of noise-reducing devices in use in Europe, and has since been experiment-

ing in the light of what he learned. The most practical results, however, have been secured through direct observation of the local conditions. It is to be feared that noise, and the methods by which it might be made less, have never received sufficiently serious consideration in New York. The elevated lines on Manhattan Island are so vital a necessity to the community that they have been accepted with all their evils, of which noise is not the least. Any genuine reduction in the noise nuisance along the avenues containing the elevated structures should have a marked influence on adjacent property values, entirely apart from the benefit directly conferred on the passengers and the community at large. The smoke evil receives short shrift in New York, but the noise evil is an unfortunate attribute of a great city which requires something more than Health Commissioners' orders. When sleeping cars were a novelty, the late George M. Pullman is reported to have been asked: "How do you make your cars quiet and easy riding?" The answer was: "No one panacea. Solid work and tight joints from the wheels to the ventilators." This suggests the only adequate remedy for Boston's noise annoyances. It can never be made complete, for the booming sound is inseparable from a fast train; but the racket from loose rivets and lost motion can be got rid of by thorough work.

NEW PUBLICATIONS.

Moody's Manual of Corporation Securities. Fourth annual number, 1903, issued by the Moody Publishing Co., 35 Nassau street, New York. 2,400 pages, 5½ x 9. Cloth, $7.50.

Moody's Manual is useful as a time saver, because it contains, within the limits of a single volume, information about all kinds of American corporations, including banks, railroads, lighting and electric plants, mines, etc. Following an introductory article on the "Choice of a Corporate Home," membership lists are given of all the stock exchanges in the United States and Canada, and then the main portion of the book is filled with the statistics previously mentioned, classified in sections. In the appendix there are operation figures of water, gas, electric light and other plants owned or worked by municipalities, and there is also a classification of industrial combinations, with percentages and analyses. The latter is rather unique; 235 "trusts" are listed, with the statement that the catalogue does not include transportation companies nor other public service corporations, but is made up entirely of manufacturing or producing enterprises which have changed from smaller competing concerns to consolidations. The Manual has been increased in size, year by year, by the addition of new matter, and the current issue contains much that is of value.

Structural Steel: Reaming; Unit Strains.—A compilation of data and discussion of current tendencies and practice. American Railway Engineering and Maintenance of Way Association, 1562 Monadnock Building, Chicago.

This is Bulletin No. 41 of this association, prepared by the Committee on Iron and Steel Structures, Mr. J. P. Snow, Bridge Engineer of the Boston & Maine, Chairman. The compilation of published and unpublished information contained in the bulletin has been made preliminary to a series of experiments which will be made to determine the safe limit of plain punching and the amount of reaming needed to remove the injured metal when the said safe limit has been passed. A summary of experiments on the effect of punching and reaming steel is given, and also the practice followed on 22 railroads in the United States. On the subject of unit strains, references are given to literature covering the discussion of this subject and the character of loading for the past 30 years. There is also valuable information on strains under dynamic loads and unit strains in compression members. An appendix contains the specification for material and workmanship for steel structures, which have also been issued in separate pamphlet form, as noted in our issue of July 17.

Manual of Statistics Supplement. New York: The Manual of Statistics Company, 25 West Broadway. Annual subscription $5.00 for ten months (May and June omitted).

This is a new monthly periodical which is to be regularly issued in order to keep the Manual of Statistics up-to-date. The first number consists of 87 pages, uniform in size and style with the Manual. The book is made up largely of statements concerning corporations and their doings which are of permanent interest, and which, but for this Supplement, would not be readily available until the next annual issue. Many of the statements relate to new corporations that have not before appeared in the Manual. To annual subscribers a cloth binder, with a stiff back, is provided, which holds the ten monthly numbers. This is similar in size and style to the Manual.

Tools and Machines. By Charles Barnard. New York: Silver, Burdett & Co., 1903. Price 60 cents.

The object of this little book is to instill in the minds of the younger generation a love of honest manly work and a knowledge of the tools and machinery which are the implements with which our civilization has been molded. It is written in simple conversational style and might well be used as an elementary text book in manual training in the public schools. The subject matter is part historical and part instructive, a few simple directions and suggestions for the use of each tool and the brief story of its evolution from the earliest forms devised by primitive man. It is illustrated with a number of wood cuts and contains 158 pages.

TRADE CATALOGUES.

The Index Co., of Pittsburg, has published a "Business Proclamation Supplement" of 192 pages, 13½ x 10½, designed to show the great increases which the city has, in recent years, made in wealth, population, and the development of manufacturing and commercial interests. During the past five years the output of the factories, mills and shops of the district has been more than doubled; the amount of capital invested has increased in the same proportion, and the number of men employed has grown almost as much. Like the prospectus of a "boom town," the book is roseate with exultation, but the truly remarkable development and evident future possibilities of the city serve as a solid foundation for prophesy. The book is profusely illustrated with photographic reproductions, and is an interesting document.

The Day-Kincaid Stoker Co., Cincinnati, Ohio, sends a nicely gotten-up 20 page catalogue, illustrating various elevations of the Kincaid locomotive stoker detached, and also in position before the fire-box. The makers claim that the modern locomotive has outgrown the capacity of the fireman, and the eight illustrations in their catalogue show clearly the mechanism designed to lessen his labor, and conduce to better and more uniform firing.

F. H. Melville, 192 Front street, New York, has sent out some descriptive matter setting forth the merits of "anti-rust" compound used for covering the bright parts of locomotives and other machinery. It is claimed to be impervious to the action of dampness, salt water, acid or ammonia fumes and heat or cold. The compound only weighs 9 lbs. to the gallon. It is used by the Pennsylvania Railroad.

The T. H. Symington Company, Baltimore, Md., has issued an artistic catalogue describing and illustrating their products. The causes of failure of journal boxes are discussed at length and the elements of strength of the Symington box are pointed out. The catalogue also includes descriptions of "mogul metal" and the Symington dust guard.

The H. W. Johns-Manville Co., 100 William street, New York, has printed a folder showing a new kind of enclosed fuse branch block, in which the main wires are placed in grooves in the porcelain base arranged between the terminals of the branch fuses. The company will furnish additional information on request.

The American Well Works, Aurora, Ill., has issued Circular No. 88 containing selected pages from its general catalogue of well and pumping machinery. The appliances shown in this circular are particularly adapted to deep well pumping either by compressed air lifts or direct acting lift pumps.

About Steam Shovels is the title of leaflet issued by Vulcan Iron Works Co., of Toledo, Ohio. It makes the briefest possible description of the kinds of work to which their machines are adaptable, and is daintily illustrated.

Tunnels in Chicago for Underground Traffic.

The Illinois Telephone & Telegraph Company, which was granted permission in 1899 to build tunnels and conduits under Chicago streets for telephone service, has had the franchise extended by the City Council to include apparatus for the transmission of newspapers, mail matter, packages, parcels and merchandise. At the expiration of the grant, in 1929, the tunnels are to become the property of the city, without further consideration. The district for trunk tunnels is bounded by 22nd street, Halsted street and Chicago avenue. The company is also granted permission to build trunk tunnels and smaller tunnels in the district outside of this not nearer than half a mile apart, where they are parallel. The city retains space in the tunnels free of charge for the use of its telegraph and telephone system and electric light wires. It also retains the right to regulate the building of the tunnels through its various departments. The company must place underground all present overhead wires at the demand of the city. It is given the right to lease space in the tunnels subject to the regulations of the ordinance.

At the expiration of the grant, when the tunnels shall revert to the city, if the company shall make as good a bid for their use as any competitor it shall have the preference, provided 50 miles of tunnels shall have been completed in 10 years.

The compensation to the city shall for the first 10 years be 5 per cent.; for the second 10 years 8 per cent.; for the rest of the term, 12 per cent. of the gross receipts. The city must also receive annually 20 per cent. of the gross receipts derived from the rental of space. It is said that the plans of the company contemplate a complete system of underground delivery throughout the city of all freight not too bulky to be loaded into its cars, which are to be 10 ft. long and 4½ ft. wide. Mention is made of extending the tunnels to the yards of the Chicago Transfer & Clearing Company, southwest of the city, which may probably be made a general delivery point for all Chicago roads. The small parcel business will be designed to handle the deliveries of the downtown stores, delivering for certain districts to central points for distribution.

Water Tightness in Concrete.*

Concrete foundations of buildings, wheel pits, and other works below the flood planes of adjoining rivers, though built as they generally are with special reference to water tightness, are frequently found to leak, or at least to flush with dampness, under the strain of only a few feet pressure.

Concrete powder magazines set in hillsides, or behind the esplanades of coast fortifications, are notably hard to keep dry. An instance is recently cited of a magazine, when there was occasion to dig a ditch 2½ ft. deep, outside the concrete, which ditch being suddenly filled during a rainstorm, leaked through 30 ft. of concrete rather than through the sandy loam soil of the esplanade, which descended seaward with a considerable slope. The water in two days penetrated through the roof of the magazine, which was 10 ft. below the bottom of the ditch, and, as before said, distant from it 30 ft. There are engineers, however, who prescribe 1-2-4 concrete in a layer of a few inches thick, in the bottom of extensive reservoirs, to make them water tight.

True, this concrete is usually laid over a course of from one to three feet of clay puddle. It is the writer's opinion that while many concrete lined reservoirs have proved to be impervious, the credit for their tightness is due, in most cases, to the puddle. The specifications usually provide in reservoir work, that the mortar should be composed of 1 cement to 2 sand, and sufficient of this mixture to be used to fill the void in the gravel or broken stone whichever is used.

Experiments conducted about a year ago at the Thayer School of Engineering on the permeability of concrete under hydrostatic pressure, gave the following general results:

First.—With mortar, 1 part cement to 2 parts sand (ranging from 30 to 45 per cent. of the concrete), at 80 lbs. pressure, at the end of two hours with concrete 5 in. thick, 11 specimens leaked, seven specimens did not leak.

Second.—With same proportions and time under 40 lbs. pressure, five specimens leaked, seven specimens did not leak.

Third.—With same proportions and time under 20 lbs. pressure, four specimens leaked, or all that were tried. The fineness and other particulars, which should be known regarding the cements used in their series of tests, were not given in the published reports, though it was stated that cements were of standard brands. Rather curiously, the one brand, furnished by the manufacturers as being specially adapted for making water tight concrete, gave the poorest results.

About all that can be said of tests of this sort is that the permeability of concrete depends altogether on the fineness of the cement, and the degree to which the voids in the sand are filled with it. Of the 14 tests, at the Thayer School, made with the same grades of cement, where the mixture was one cement to one sand, none of them leaked.

The engineers and the inspectors are extremely careful in making tests of the setting qualities and tensile strength of the cement they use, but considering the vast amount of published information in regard to the use of cement, it is remarkable that so little has been written on the subject of water tightness in concrete.

No doubt the military engineer, when he dug the ditch outside the massive concrete fortification, never dreamed that the rain would fill it, or if it did that the water would leak through the concrete in preference to going through a few feet of sandy loam. Why, we may ask, was the sandy loam more water tight than the concrete? The answer is simply that the loam contained more fine particles of cement to fill the voids in the sand than there were fine particles of cement to fill the voids in the concrete mortar used in making the concrete.

The visual test is alone used by inspectors in determining whether the voids in the concrete are filled, yet it may be demonstrated that, with an absolutely impervious mortar, a water tight concrete may be made in which there may be many and easily discernible voids, and conversely, there is such a thing as filling all the visible voids in the gravel, even having a surplus of mortar, and yet discover that the concrete will leak. It is apparent, therefore, that we should be concerned, where water tightness is important, with the voids in the sand and in the fineness of the cement used for filling them. A good idea may be formed of the comparative void filling capacity of cement and clay, by trying samples of each which have passed through sieves of standard mesh, and noting the time of the deposition of equal volumes in water at given intervals, until the point of clarification is reached. While the writer is not aware that any such tests have been made, he believes that clay can be found of red, blue, and so-called yellow, or any other natural colors from veins in our hillsides that will win

*Extracts from a paper read before the Engineers' Society of Western Pennsylvania by Thos. P. Roberts.

out in such a test every time. The sp. gravities of clay and Portland cement are not materially different, so the suggested test would show their relative degree of fineness. It is to the minuteness of the particles used in filling the voids in the sand, that the imperviousness of the concrete is due.

The question might also be raised as to whether the chemical combination of cement and sand, with the result of the formation of silicates, may not be productive of voids, possibly very minute, but so interwoven as to form a connected tissue of voids through which water may percolate under pressure.

It is very often the case that muddy water rising about concrete, masses, sufficiently rapidly to develop pressure, will force clay particles into the cement and seal them water tight, sometimes permanently, and sometimes not, for with the subsidence of the water, the retained clear water in the concrete may exert a sufficient "back" pressure to drive out the mud particles previously deposited over the surface of the concrete.

Concrete is coming into vogue extensively in all kinds of work, both above and below water, but so far as the writer's observation extends, little or no difference is made either in the composition or in the method of placing concrete which is expected to stand hydrostatic strains and the action of frost and that which will not be exposed to such strains. We have in Western Pennsylvania examples of exceedingly hard grey, and bluish colored sandstone of great tensile strength, and of close texture which nevertheless crumble and disintegrate in a few years' exposure to the action of moisture and frost. Then we have a coarse-grained, yellow-brown stone, in the Beaver Valley, of little tensile strength when quarried, which withstands the action of moisture and frost without disintegration, and it is reasonable to believe that we may find the same unexpected differences in the durability of cements.

A Russian engineer, who recently visited Pittsburg, remarked in the presence of the writer that he had traveled extensively through Germany, England, Canada and the United States, and everywhere his professional brethren pointed out to him their wonderful concrete constructions, but he said the Russian engineers were holding back their approval, waiting for the test of time, which alone would determine the durability of concrete, especially of concrete in peculiarly exposed situations.

The Russian may be right in part, and the writer believes he is, in questioning the durability of concrete exposed to the action of water and frost, and which concrete is not in itself water tight. It might be well to consider the expediency either of constructing cores in concrete walls of some really impervious material, or covering their surfaces in such manner as to keep the water out, leaving "weep holes" so to speak, below the frost line for retained water to escape. That Russian engineer may return to America a few years hence, and it would be peculiarly grating to hear him say, "Didn't I tell you so?"

The Waugh Draft Gear.

The construction and action of the spring draft gear patented by J. M. Waugh, Chicago, are shown in the illustrations. In Fig. 1 all parts are shown at rest. Fig. 2 shows all spring plates curved, the coupler having traveled 2 in.—the buffer of the coupler being in contact with the dead-block.

The gear has malleable iron or steel pocket castings, recessed into the timbers 1 in., with flanged projections extending along the inner face of the draft sill and bolted through the timber to prevent splitting. Two lugs are cast on the inner face of the pocket casting on which slide abutment blocks, D, which are provided with oblong slots corresponding to the lugs in order to allow the abutment blocks to travel in either direction. Surmounting the lugs are caps, E, which hold the abutment blocks in position, and the coil spring to a center line. The double-coil spring is standard 8 in. x 6¼ in.

The plates composing the followers are spring steel, ¼ in. thick, 6 in. wide and 12 in. long. Groups A and A¹ are auxiliary followers, each composed of six straight plates in the gear illustrated. Groups B and B¹ are the main followers, each being made of eight plates. F and F¹ are thimbles inserted in each end of the coil spring, which come in contact ⅛ in. before the spring is closed, to prevent it from being driven solid. Between each auxiliary follower group and main group is a separating block, C, made up of two parts, one of which is provided with lugs, and the other with corresponding holes. Between the parts is a steel plate, 1/16 in. thick and of the same length and width as the follower plates, to hold the block, C, in the center.

The surface of the block C in contact with the auxiliary group has a 5/8-in. curvature, and the opposite surface has a 5/16 in. curvature; these being the curvatures taken by the auxiliary and main groups respectively when the coupler has traveled 2⅛ in. in either direction. In Fig. 1 the relation of abutment blocks and auxiliary groups will permit the coil spring to be compressed ⅜ in. before pressure is exerted on the auxiliary groups through the abutment blocks.

The gear is designed to have three grades of cushion in service. When the coil spring has been compressed ⅜ in., the backward movement of the auxiliary group,

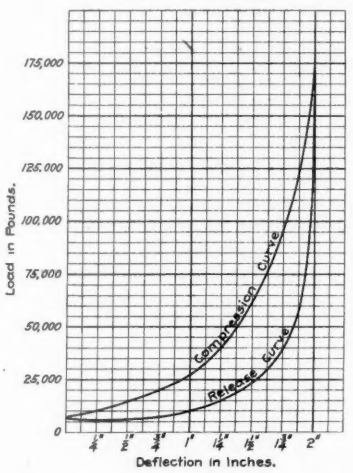


Fig. 3.—Test of Waugh Draft Gear.

A, will move the abutment blocks until they come in contact with the auxiliary group A¹, compressing the spring about 7,000 lbs. When the coil spring has been compressed 1¼ in. more, each auxiliary group will be curved ⅝ in., in opposite directions, due to the abutment block, absorbing about 83,000 lbs. in a total travel of 1⅝ in.

The bearing shoulders of the pocket for the main followers are not at right angles to the wall of the pocket, but diverge at an angle which will allow these followers to be curved ⅜ in. out of a straight line before taking the angle of the shoulder. In the relation shown in Fig. 2 the thimbles in the springs are in contact, and the rear followers are curved to the angle of the shoulders, the total travel being 2 in. A compression test showed that 183,600 lbs. was required for this condition.

After the coil spring has been compressed until the abutment blocks are brought into contact with the auxiliary groups the force of the blow is resisted by the front and back followers to an equal extent, but in opposite directions. During the travel of the coupler the spring plates relieve the draft gear and timbers from solid shocks. Prevention of recoil is provided by the adhesion of the smooth surfaces of the steel plates in each group through pressure of the abutment blocks, which curve them together and check their return to a straight position until the coil spring is released. The same action takes place for tensile stresses except in the opposite direction.

The maker reports that tests made with different combinations of the plates have shown 93,000, 125,000, 166,000, 183,600 and 218,000 lbs. respectively absorbed in 2 in. of travel.

The gear is being used on high capacity cars, with satisfactory results it is claimed. The 125,000 lbs. capacity gear is being used by some roads on passenger equipment. It is made and sold by the Waugh Draft Gear Co., Monadnock Block, Chicago.

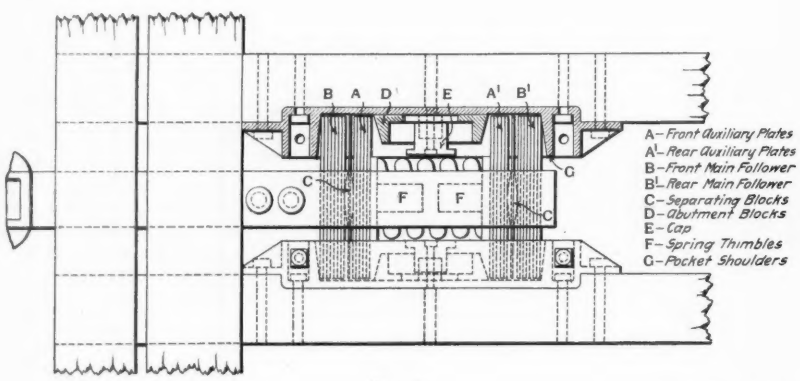


Fig. 1.

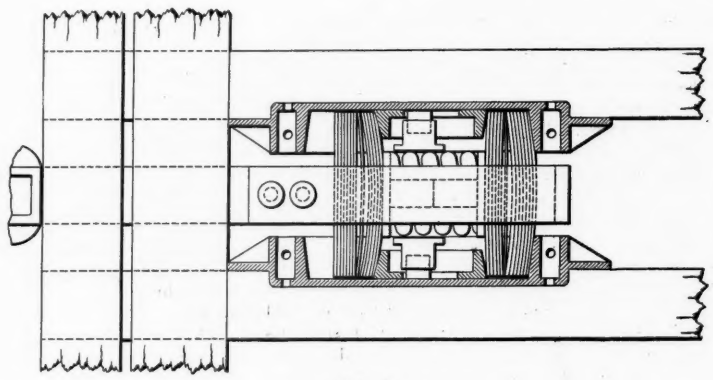


Fig. 2.

The Waugh Draft Gear.

Railway Transportation Association.

The semi-annual meeting was held at the Cadillac Hotel, Detroit, July 29. The Secretary's report gave the result of two letter ballots, ordered owing to small attendance at the January meeting. On recommending an increase in the present per diem rate of 20 cents per car per day, 20 voted in favor and 18 against. On the desirability of adopting a penalty for car diversions, there were 18 in favor, and 20 against.

Owing to various causes out of the six remaining committees only one reported, that on "Per Diem," as under: The committee is stronger than ever to the effect that the per-diem method of settling for car hire *has accelerated* the movement of equipment in comparison with the old mileage system. When business conditions are prosperous it appears to be the practice of the car borrower in order to take care of traffic offered to keep control of such cars belonging to other roads as come into his possession, regardless of the rate, be it 20 cents or $1 per day. When business conditions are depressed, the car loaner cannot even force its equipment upon the car borrower, the result being a heavy return flow of empty equipment to the owning roads, whether it is desired or not, or the resultant loading of home equipment to other lines in order to get it into active service. To take care of business offered is the first thought of the transportation department; the return of empty equipment to its owners is an after consideration. To be in a position to promptly load and despatch foreign equipment without undue empty movement might be considered the ideal rather than the average. To be enabled to take care of all traffic offered without diversion of cars seems to be a position which is very difficult to maintain. The equalization, therefore, of the distribution of equipment, and, as far as possible, the per-diem balance, to a degree that would be satisfactory alike to the car borrower and the car loaner, would seem to be the goal toward which our energies should be directed.

It is the belief of your committee that the intent of the per-diem settlement was to facilitate the return of each car to its owner promptly upon its release from the original load and that it was in no way intended that 20 cents per day shall be a compensation to the owner of the car when in local use on foreign lines, in which service the owner has no interest whatever, but rather that the rate of 20 cents was to cover the use of the car in service carrying freight over two or more lines in which they are all interested.

Many car movements indicate that foreign cars are not kept either in home route or moved in the homeward direction after release from the original load. The results of this practice are that cars are unreasonably detained on foreign lines and that without the consent of the owner they are used for the movement of traffic in which the owner is not in the least concerned, and we wish to emphasize and have this association recognize the apparent growing tendency of this evil.

Your committee respectfully suggests that this matter be brought to the attention of the American Railway Association with a view of bringing about a more careful compliance with car service rules Nos. 1 and 4, which, if strictly lived up to, would, we believe, decrease the detention of home cars on foreign lines.

Your committee respectfully calls attention to the decision of the arbitration committee, "Case No. 4," and feels that the ruling will place a hardship upon the delivering line. While it is an admitted fact that the delivering line should not improperly deliver cars to connecting lines, yet errors will occur from improper carding and from other causes, and it is our opinion that the receiving line is equally responsible in not detecting errors of this kind, and immediately correcting them by a return of the cars or advising the delivering line to the extent that it should be responsible for all per-diem in excess of 24 hours or one day.

Your committee have observed that those roads which are so equipped with yard and track facilities, as to enable them to accept, handle and release foreign cars, whether such is the result of geographical location or the provision of necessary facilities for storing freight, supplying their own equipment for transfer, etc., are the roads that profit to the greatest extent by the application of per diem rules.

The subjects for discussion were:

No. 1. After a car has been held by a road 30 consecutive days, will a penalty rate of 80 cents per day (in addition to per-diem), automatically applied, be of any substantial benefit?

No. 2. Will not the automatic application of the 80-cent penalty rate tend to the pooling of equipment, in so far that the road possessing the car will disregard all routes or regulations as to car movement by simply loading the car to any point via any route?

No. 3. Should not Rule 15 read "in transit" instead of "already loaded with such traffic," for the reason that as at present worded it leads to dispute as to what should rightfully be included under the per-diem rules?

No. 4. What has been the experience of the application of Rule 14 in connection with interchange of cars by float or car ferry?

Discussion ensued upon the items referred to in the report, also on one or two other points relating to the practical working of the per-diem plan; and while it was freely conceded that the application of the 80 cent penalty rate was a powerful and valued auxiliary in getting cars home, yet it was also made clear that congested conditions had occurred during the year on several large roads, which had effected car movement to such an extent, that no figure of penalty could have secured an earlier return of cars; in fact, it was stated by a member that his road, owning over 80,000 cars, had paid out in penalty from this cause as much as $20,000 in a single month. Several spoke in favor of making the penalty automatic after 30 days, but the majority were satisfied with Rule 3, and did not desire any change.

Decision No. 18 of the arbitration committee of the American Railway Association was not favorably received, as under it switch roads had to pay per-diem on cars of the long haul road, but could not reclaim, and therefore did not get the protection which Rule 5 was framed to afford them.

The following resolution on the subject was unanimously adopted:

"Whereas, Questions have arisen as to definition of a switch car as referred to by decision of arbitration committee of the A. R. A. as per question No. 18:

"Resolved, That we request the car service committee of the A. R. A. to so define a 'switch car' as to read that it be determined by the character of service, regardless of compensation or by whom paid."

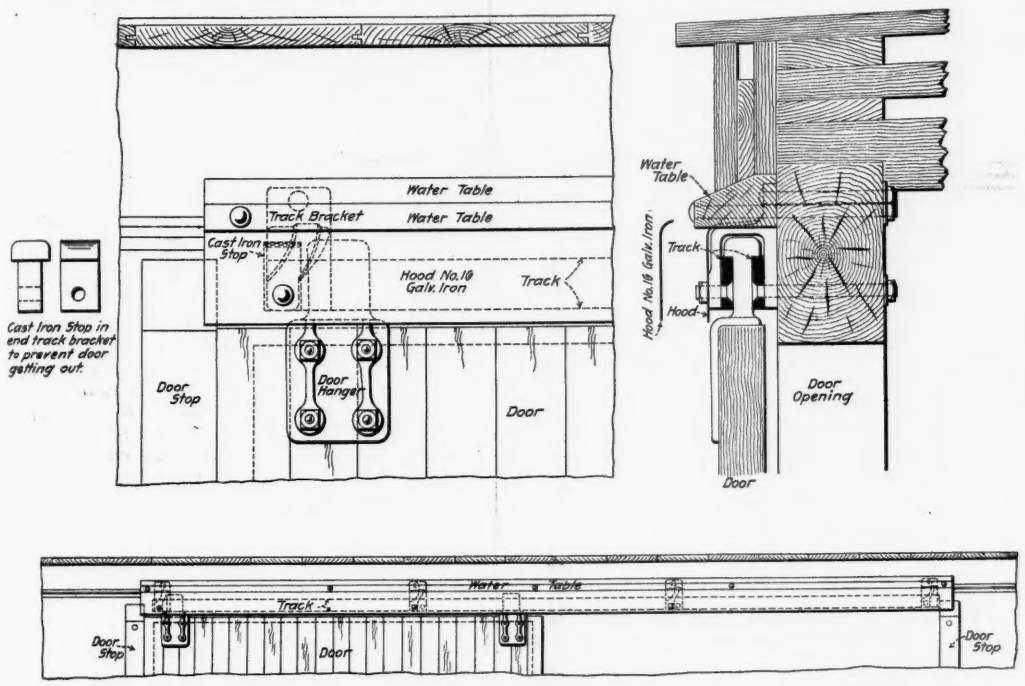
As an illustration of the possibilities opened up by decision No. 18, it was said that a certain road had a train of live stock in transit, which at their terminal had to be switched by another road to the shipper's yard; and the car service officer of road No. 1, having studied this decision, saw a way of getting per diem on his cars without allowing any reclaims; so calling up the consignee, he persuaded him to make his own arrangements for the switching, and to pay for same to agent of the switching line; the result being that when road No. 2 presented the usual reclaim for the per-diem paid, they were referred to decision No. 18, and informed that as per this high authority, no reclaim could be allowed on such cars.

Mr. M. B. Casey read a paper on "the effect of per-diem on transfer stations," and generally upon the handling and consolidation of L. C. L. freight, in the effort to secure fair loading of cars; and the result of his investigations was that the effect was quite favorable, and so far as his road was concerned, there was no tendency in the new system to encourage the movement of a lower tonnage per car than under mileage.

Officers for the ensuing year are: President, T. R. Limer, Hocking Valley R'y, Columbus, Ohio; Vice-President, T. F. Brennan, B. R. & P. Ry., Rochester, N. Y.; members of executive committee, M. B. Casey, F. S. Rawlins. It was also decided to hold the next meeting at Cincinnati on Jan. 27, 1904.

The Dudley Door Hanger.

Mr. B. F. Dudley, St. Joseph, Mo., formerly foreman of freight car repairs of the Kansas City, St. Joseph & Council Bluffs, has patented a hanger for side and end doors of cars, of which an illustration is shown. It is claimed for this hanger that it is impossible for a door to get lost off of a car, or to get out of place, unless the parts are actually broken, and the door torn off. As will be seen from the drawing, the track and hangers are protected by a water table and a hood made of galvanized iron or steel.



The Dudley Door Hanger.

Some of these hangers were put on several cars about a year ago and are reported to be giving entire satisfaction. Mr. Dudley either furnishes the hangers, or permits their application on a royalty basis.

The Organization and Administration of an American Railroad.*

BY LIEUT.-COLONEL H. A. YORKE.

The ownership of a railroad in America is, as in this country, vested in the shareholders, who exercise their control through a board of directors, with a chairman at their head; but, as is well known, these do not play a very important part in the management.

The directors elect a president, who is the chief executive officer, and exercises all the real powers of control and direction. Frequently the president is also chairman. It is interesting to note that the president is sometimes an engineer; for instance, President Cassatt, of the Pennsylvania Railroad, the most important line in the States, is an engineer; so also are President Ramsey, of the Wabash Railway; President Loree, of the Baltimore & Ohio Railway, and President Burt, of the Union Pacific Railway; and in addition to these several vice-presidents are engineers. In fact, engineers seem to have larger opportunities for advancement in this direction in America than in England. Or perhaps I should say that ability, wherever found, obtains more speedy recognition.

The president's authority is supreme, and his brain and intelligence direct the entire concern. In this way is obtained that personal control which, when the man is worthy of his position, is productive of brilliant results.

The president is assisted by a number of vice-presidents, each of whom supervises one of the departments into which the administration is divided.

The principal departments are usually the following:

Law department;
Treasury department;
Traffic department;
Operating department;

but sometimes there are more. The functions of these departments are sufficiently defined by their names, the only ones to which it is necessary to draw attention being the two last named.

The traffic department has charge of the passenger and freight traffic, the tariffs, the interchange of business with other railroads, and the commercial relations with the public.

The operating department has charge of the construction and maintenance of the railroad, its equipment, the trains and stations, and of the *personnel* and discipline of the service.

The interesting feature here is the separation of the traffic or commercial duties from the operating or working duties. This arrangement is contrary to English practice, which combines the duties of the two into one department, called the traffic department. The North-Eastern Railway and, I believe, the Great Northern Railway have recently adopted an organization similar to the American practice in this respect, and it will be very instructive to learn the results.

The advantage of this separation can, I submit, hardly be doubted. The operating department has charge of all the physical resources employed in the safe and economical movement of goods and passengers. It is the life and soul of the whole organization, and upon its vitality and the healthy performance of its duties depends the very existence of the railroad. Its responsibilities are so vast, and the demands upon its activity so constant, that it seems sound policy to relieve it of all anxieties which are not strictly connected with the movement of traffic. The operating department is, I suggest, somewhat in the position of the works manager of a large manufacturing concern, whose duty it is to produce a certain article at the most economical rate and as rapidly as possible consistently with good workmanship. The operating department has to supply transportation at the lowest possible rate and in the most efficient manner. The traffic department, on the other hand, resembles the selling agent of the manufactory. It sells the article produced by the other—viz., transportation—at the best possible price obtainable. It watches competitive concerns, makes and enforces rates for goods and passengers, builds up the business, and transacts all negotiations with other railroads and with the public.

I propose within the time at my disposal to deal chiefly with the operating department. This is under the immediate direction of the general manager, and is divided into:

The road department.
The machinery department.
The transportation department.

The general manager may be under a vice-president, but in some cases the general manager is the vice-president. I would say here that the organization I am putting before you is typical of that employed upon a fairly large railroad, and it is liable to variation, according to circumstances. For instance, sometimes the traffic department is under the general manager, although still distinct from the operating department; in others it is under a separate officer or vice-president. In very large organizations there may be two or three general managers, each with his own territory, in which case there would be a vice-president over them all.

The road department is in charge of the chief engineer, the machinery department is under the superintendent of motive power, and the transportation department is under the general superintendent, all of whom report to the general manager. The chief engineer has a large staff of assistants at headquarters, including engineers for new works, an engineer for bridges and buildings, an engineer for maintenance of way, and a signal engineer. The superintendent of motive power has under him a mechanical engineer, who is in charge of the drawing office and of all standards and details, and two assistants—one for engines and the other for cars. The general superintendent has one or more assistant general superintendents, a superintendent of transportation, a superintendent of telegraphs, besides a chief surgeon, a chief claim agent, and a chief of police.

When a railroad exceeds 300 miles in length, it is divided into divisions, which, in thickly-populated districts, do not usually cover more than 100 miles, each division being under the control of a divisional superintendent, in whom is focussed the authority of each of the general officers already mentioned. The divisional superintendents, in fact, become the general managers of their divisions. The divisional superintendents report to and receive orders from the general superintendent. All orders to the officers of the road and machinery departments should pass through them; and although, to save time, communications may pass, for example, from the chief engineer to the divisional engineer, the divisional superintendents are responsible for the execution of all orders and for the discipline of the men of all departments in their divisions. Each divisional superintendent has, to assist him, a staff consisting of a train-master, in charge of the transportation service; a master mechanic, in charge of the machinery service, and a divisional engineer, or, as he is frequently called, a road-master, in charge of the affairs of the road department.

The division officers are in immediate charge of the operation of the train service, and of the maintenance of the road-bed and track, the signals, bridges, buildings, locomotives, car shops and engine houses. It is their business to see that the work is carried out according to the policy adopted by the management. It is not their concern whether the policy be wise or not, nor are they responsible for the results, except so far as these are dependent upon the efficient performance of their duties.

The divisional engineer is assisted by several supervisors—viz., of track, bridges and buildings, signals, water works, etc. The master mechanic is assisted by a general foreman of the shops, in which there are other foremen in immediate charge of the fitters, boiler makers, carpenters, and other workmen. He also has under him a foreman of the engine house, in charge of the locomo-

*Paper read at the Engineering Conference of the British Institution of Civil Engineers. Section I.—Railways. June 18, 1903.

tives and their running repairs, and of the enginemen and firemen so far as their mechanical duties are concerned.

The trainmaster has charge of the train service. He has jurisdiction over the stations and yards, and of the road in the division, and over the train crews and engine crews while on the road. He must give special attention to the weight and tonnage of the freight trains, and see that the locomotives are loaded to their full capacity. He is assisted by a chief train-despatcher, who is in direct charge of the train movements, of the telegraph lines and operators, and of the office records. He has also under him the yardmasters and station agents.

When a train starts out on the road, its movement is watched day and night by the operators at every telegraph office, and the time every train passes every station is telegraphed to the train despatcher, who enters the time on the train register. At each station is displayed a special form of signal known as the "train order signal," by which a train is stopped by the orders of the despatcher, who thereby controls the movements of all trains. The running of regular trains is, as a rule, governed by the time-table; if, however, they get out of course, the assistance of the despatcher is needed. Extra trains are entirely dependent on the despatcher. The system of train orders is elaborate, there being no less than 13 different standard forms of such orders, but time does not permit me to go into this detail of American practice and its results.

In the discussion following, Mr. George S. Gibb, General Manager of the Northeastern Railway, called attention to the fact that Colonel Yorke had not included the accountant, and in this he thought he was right, as the accountant had no place in the actual working of the railroad, but merely recorded transactions and data for the use of others. He thought, however, that there was nothing more striking in American methods than in the use made of the information provided by the accountant's office. He considered that in this was to be found the source of all the marvellous progress and success accomplished; and where American methods were superior, the origin of this superiority lay in the perfect and complete system of securing and tabulating statistics, and not in mechanical genius, commercial activity, or business shrewdness. All officers in all departments were thus supplied with detailed information which enabled them to manage their business to the best advantage. After he had arrived at this conclusion he received a letter from Mr. Hill, of the American Great Northern Railway, which suggested that Mr. Gibb would find in this system of providing data the secret of American success.

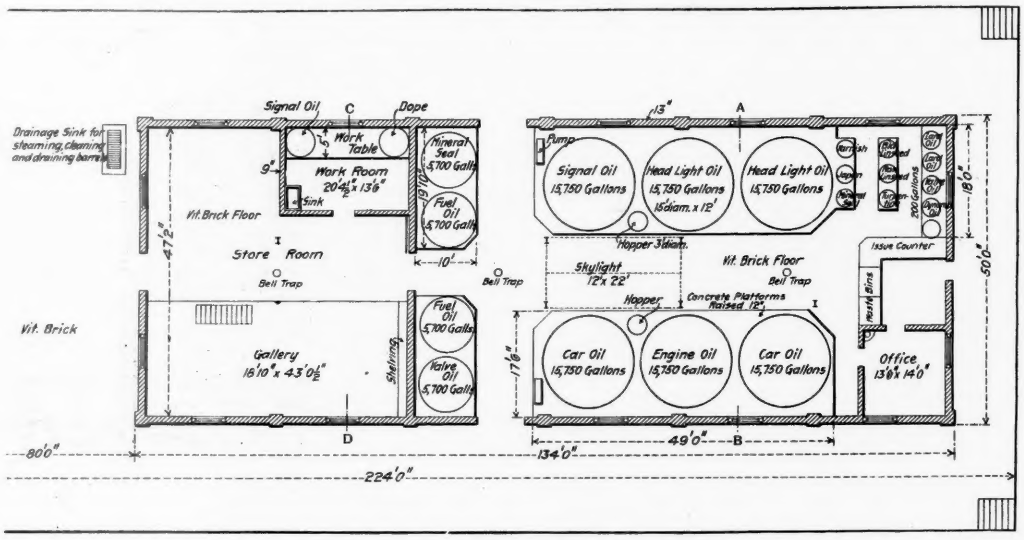
Oil House for the Oregon Short Line.

In connection with the location of the principal shops of the Oregon Short Line at Pocatello, Idaho, this point will also be made the central base of oil supply for the line. Additions to the new shops recently completed at that point will include a large oil house, for the plans of which we are indebted to Mr. J. B. Berry, Consulting Engineer.

The building is quite similar to the Union Pacific oil house at Omaha, after which it was patterned. It is 50 ft. x 134 ft. outside, and is of brick on concrete foundations, with a gravel roof. The windows and transoms are protected by Andreen's fire shutters, which are made of iron and may all be opened or closed simultaneously by means of a crank on the inside of the building. Surrounding the building is a platform with a vitrified brick floor on a filling of sand over cinders. This platform extends 80 ft. beyond the southeast end of the building, and is intended for storage purposes.

A brick wall divides the interior. On one side is a tank room, 96 ft. long, from which the office, 14 ft. x 13 ft. 6 in., is partitioned off; on the other side is a store room, 43 ft. long, which contains a work room, 13 ft. 6 in. x 20 ft. 4 in. The partitions which divide off these smaller rooms are also of brick. The flooring is of vitrified brick throughout, except in the office.

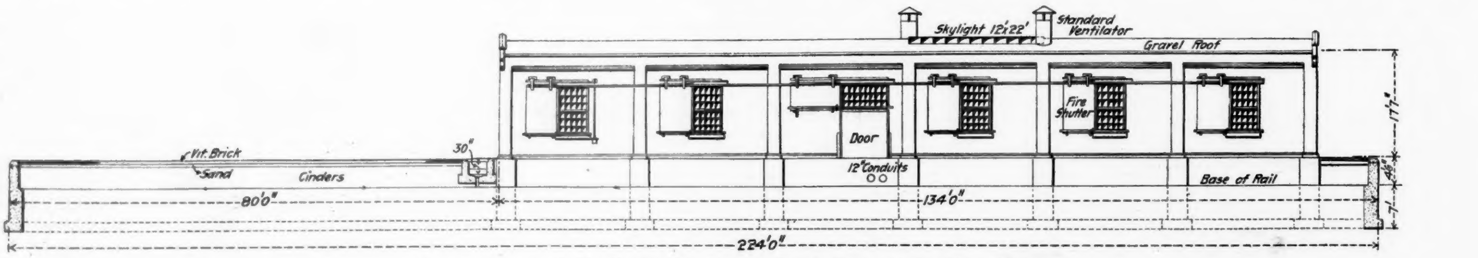
The tank room contains six tanks which are 15 ft. in diameter and 12 ft. high, with a capacity of 15,750 gallons each. They are arranged in sets of three on a side, one set containing the black, or lubricating, oils, and the other, the white, or illuminating, oils. Each set stands on a concrete platform 17 ft. 6 in. wide, 49 ft. long and raised 12 in. above the floor. These platforms are supported on a grill of old rails, spaced 24 in. center to center, in both directions. The total thickness of platform is 24 in. Across the transverse passageway from the large tanks are four 5,700-gal. tanks arranged in sets of two on each side of the main passage, each set placed on a platform similar to those under the large tanks. These smaller tanks will contain fuel, valve and mineral seal oils.



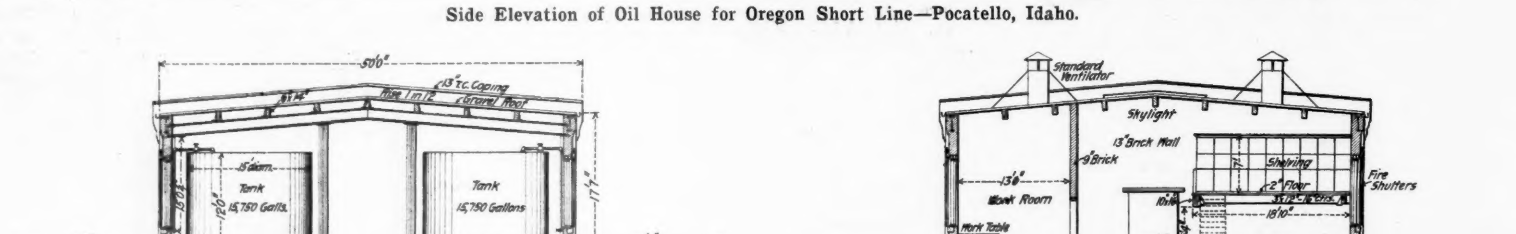
Floor Plan of Oil House for the Oregon Short Line, at Pocatello, Idaho.

The oils will be received in tank cars and pumped into the storage tanks, there being separate pumps for the white and black oils, one on each side. The location of the pumps and the piping arrangement are shown in the plan. Oil may be delivered to any tank desired by means of suitably-placed valves. The pumps are so connected that they can pump from, or deliver to, tank cars standing on either side of the house. For shipment, the oil will be drawn from the tanks into barrels by gravity.

In the store room will be carried a stock of paints and painters oils in barrels or cans. The work room is intended for mixing "dope." A drainage sink is placed outside of the store room at one corner of the building, and means are provided here for removing the residual oil from the barrels by steam, and for cleaning and draining them.



Side Elevation of Oil House for Oregon Short Line—Pocatello, Idaho.



Sections of Oil House for Oregon Short Line at Pocatello, Idaho.

The Navigation of the Susquehanna River, and the Beginnings of the Reading Railroad.

BY WILLIARD T. BLOCK.

The Susquehanna was declared a public highway by the provincial assembly in 1771, and a sum of money appropriated to render it navigable. The Durham boats, in which the first families ascended the river to Berwick, derived their names from Durham, a town on the Delaware below Easton, where they were made. They were 60 ft. in length, and 8 ft. wide, and 2 ft. deep, and drew 20 in. of water under 15 tons burden. When manned by four men with setting poles a boat progressed at the rate of two miles an hour against the current. Various improvements were attempted in the construction of boats. Isaac A. Chapman built a "team" boat at Nescopeck, and named it "Experiment." It was launched in July, 1824, but was unwieldy in size and shape, and was abandoned. The farmers at Briar Creek, with those of the whole section in Columbia County, Pa., resorted to rafts, arks and other varieties of river craft in transporting their wheat and flour to Baltimore.

Through the efforts of Christian Brobst, a pioneer in central Pennsylvania, then a member of the State Legislature, a steam boat was built at York Haven and completed in April, 1826. The boat was called the "Codorus," and was commanded by Captain Elger. This boat succeeded in passing up the river as far as Wilkesbarre, and its success resulted in the building of a second boat in May, 1826, by Captain Collins, called the "Susquehanna," a boat of larger dimensions than the "Codorus." When the boat reached the State Capital at Harrisburg, Pa., a committee of the Legislature, headed by Christian Brobst, boarded the boat. On the afternoon of May 3, 1826, the boat reached the falls of Nescopeck. These rapids were regarded as the most dangerous and difficult yet encountered. The memorable disaster that occurred at this point on that day is thus described by Col. Jacob Paxton, of Catawissa.

"With our rich pine we succeeded in raising a full head of steam, and set off in fine style to ascend the rapids. The strength of the current soon checked our headway, and the boat, flanking towards the right bank of the river, struck a rock. I stood on the forward deck with a long ash pole in my hand, and was in the act of placing it in the water, hoping to steady her, when the explosion took place. Two young men standing near were blown high in the air, and I was hurled several yards in the water. Christian Brobst, the Chairman of the Legislature Committee, and who was one of the promoters of the enterprise, was so badly injured that he was compelled to retire from all active pursuits, and the injuries received finally led to his death. All that remained of the boat floated in the current. The mangled bodies of her passengers and crew, some dead, others disfigured beyond recognition but still clinging to life, were taken to Berwick. The disaster conclusively demonstrated the impracticability of navigating the river by steam."

After this disaster the construction of a canal was then discussed as the only means of transporting the increasing quantities of products to the seaboard. On July 4, 1828, the excavation for the North Branch canal was begun.

Several furrows were plowed by Solomon Brobst; and Alexander Jameson and Nathan Beach held the plow while the former looked after the oxen. The first canal boat, the "Wyoming," passed Berwick in 1830, before the canal was opened for navigation. The "Wyoming" was followed by the "Luzerne" in 1831, and in 1835 the packet boats "Denison" and "Gertrude" were launched by Horton & Cahoon. The canal system was of inestimable value to the commonwealth, and infused new vigor in every community located on its route, but there were regions inaccessible to this mode of transportation, the mineral wealth of which demanded equal facilities for shipment. It was out of this demand that the first railroad grew and Pennsylvania shares with Massachusetts the honor of beginning a system to which the nation so largely owes its phenomenal development.

The first railroad in Pennsylvania was completed in 1827, from Mauch Chunk to Summit Hill; but Christian Brobst, of Catawissa, had five years earlier, in 1822, taken a broader view of the usefulness of the railroad. Nature had endowed him with rare foresight and reasoning powers of a high order. It is said the number of rafts floating down the river first attracted his attention, and anxious to build up the place of his residence, he began to reckon the advantage which would accrue if all this traffic could be made to pass through Catawissa to its final destination. He took accurate account of the river traffic and compiled statistics and arguments which commanded the attention of capitalists such as Stephen Girard and others, of Philadelphia. His energy did not cease with this.

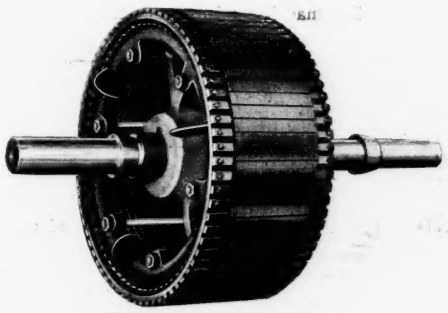
Once assured of the advantage of a railroad he proceeded to demonstrate its practicability. He could not secure the necessary instruments for making the survey, but with some knowledge of the methods employed, gained by observation, by his own ingenuity he equipped himself for the work, and with the aid of his sons, Samuel Brobst and Christian Brobst, ran out a practical line for the proposed road. Mr. Brobst possessed a "Jacob's staff." He had a tin tube of proper dimensions made, into the upper side of which he made small holes at either end. In these he inserted small glass vials, "puttied" fast, which, when half filled with water, enabled him to level his instrument. With this crude instrument he located and leveled a line which was considered by engineers subsequently employed a marvel of accuracy. His engineering skill did not enable him to get a practical route over the mountain, and the apparent necessity for an expensive tunnel balked his plans for the time. The projected road extended from Catawissa to Tamaqua.

In 1825 Brobst got certain capitalists, among them Stephen Girard, of Philadelphia, to accompany him on horseback over the proposed route. Moncure Robinson, the great engineer, was one of the party. The party was favorably impressed with the proposed enterprise and finally on March 21, 1831, a company for the construction of the road was chartered and Christian Brobst, Joseph Paxton, William McKelvey, Ebenezer Daniel and others were authorized by act of the Legislature to solicit subscriptions to the capital stock of the Little Schuylkill & Susquehanna Railroad, which was finally built and now is part of the Reading System.

S. K. C. Induction Motors.

The induction motor by reason of its simplicity and high efficiency, is becoming popular, not only as an adjunct in transmission systems where alternating currents are necessary, but also for local distribution of power in factories, mines, etc. In many instances it has been given preference over the direct current motor.

The accompanying engravings show the type A induction motor made by the Stanley Electric Manufacturing Company, Pittsfield, Mass. The armature or secondary



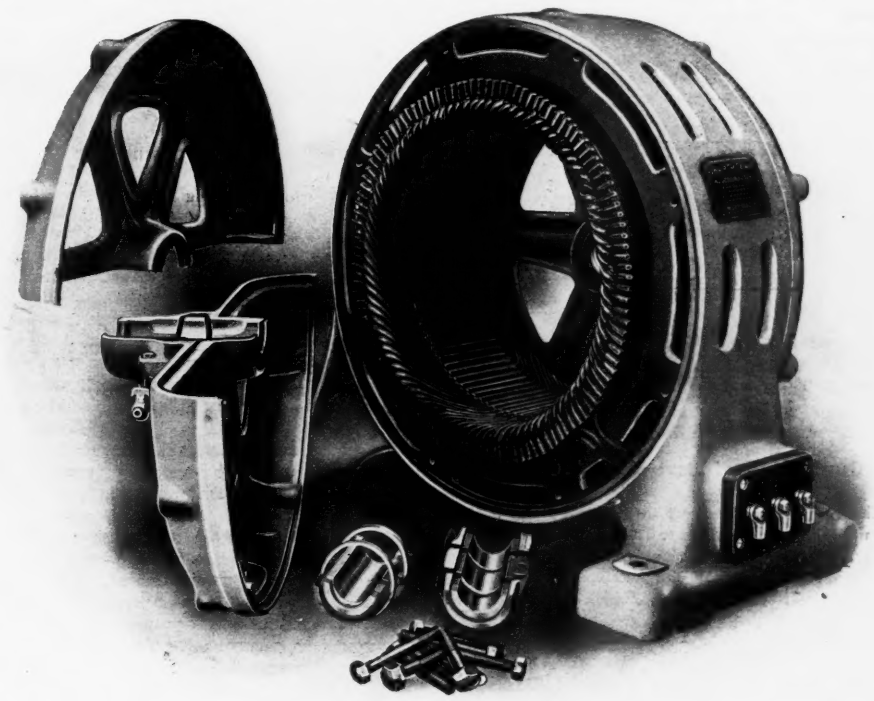
Armature of Type "A" Motor.

is the "squirrel cage" type, and consists of straight copper bars laid in partly closed slots, with practically no insulation, and short circuited by means of heavy end rings. Injury to the armature either by heating or by mechanical displacement of the parts is practically impossible, and the only wear is that which takes place in the bearings.

This type of motor is most desirable where it is not required to start heavy loads, or where a large starting current will not injuriously affect the potential regulation of the system. It is possible to start the type A motor by simply closing the line switch, and this method is used with motors below 5 h.p. But as the first rush of current amounts to several times the running current, it is advisable to use with the larger sizes of motors a device called a starting compensator to reduce the voltage and thus decrease the current.

The starting compensator consists of a single coil transformer in each phase of the circuit, with taps brought out at various points of the winding in order that a number of potentials may be obtained. The compensator is provided with a double-throw oil switch, by means of which, after starting, the coils are cut out and the full voltage of the line applied to the motor. Where motors are near a bank of transformers, it is often practicable to obtain the reduced potential necessary for starting by means of taps brought out from the secondary of the transformers.

The starting resistance of the type B motor is placed within the armature spider, and leads are brought out from several points of the resistance to a set of contacts parallel to the shaft. A lever on the outside of the motor operates a sliding collar, which is arranged to pass over



S. K. C. Type "A" Induction Motor Showing Primary Windings and Bearings.

the contacts, so that the resistance, on starting the motor, can be short circuited step by step. The type B motor is designed so that for a given torque the starting current will not exceed the running current. Therefore, this type is recommended where the motor must start heavily loaded, and where a large current would be objectionable.

The S. K. C. variable speed motor (type C) has an armature winding similar to that of type B. The leads from the windings are carried through a hollow shaft to the collector rings, by means of which connection is made with a controller for cutting in and out the external resistance. In this way the desired speed variation is secured.

It is claimed that the motors can develop a torque of at least 200 per cent. of their normal full load. The speed of the type A and type B motors varies but slightly from no load to full load, the variation not exceeding 2 per cent. in the large motors, and 5 or 6 per cent. in the small sizes.

Fuel Economy.*

A compound engine used under proper conditions is a success and a permanent institution, but to try to use it on every railroad under all conditions is an error. There is 20 per cent. saved in the compound if used right. It has been demonstrated that there is 10 per cent. fuel economy in the use of a feed water heater. . . . Sometimes, however, the cost of using it, cost of repairs, engine failures, etc., is more than the saving effected. . . .

The reduction of friction with piston valves is very great, and the cylinder clearance can be reduced. There have been tests made with piston valve engines which show about 10 per cent. saving over a slide valve engine of the same design. Engines will handle more tonnage when the piston valve is properly designed. . . .

Five per cent. saving has been claimed for blow back safety valves, but sometimes the tank water gets too hot and the injectors fail to work. . . .

It is claimed that the air pumps of a locomotive use about 7 or 8 per cent. of all the steam that is made by the boiler, especially on a mountain railroad. By condensing the exhaust and getting that heat back into the feed water you can save 5 per cent. . . .

French engineers have gone into the question of superheating steam, carrying the temperature up to about 520 deg. instead of 380. They claim 15 per cent. saving.

Much can be saved by regular and efficient firing. The mechanical stoker takes the place of the physical strength of the fireman and compels him to do the work regularly; in other words, it is a substitute for the half shovel or one shovel firing. It is perfectly legitimate to expect time of train, but overtime paid to train crews? And it is the dollar in the treasurer's box that you have got to figure on in the end, and not only the coal saving. A former receiver of one part of the present Southern Railway once said that on his road the compound engines he had were coal savers and money losers. The same thing can be said of nearly all of these devices when used under improper conditions.

*Abstract of a paper by Mr. R. P. C. Sanderson, Superintendent of Motive Power of the Seaboard Air Line, presented at the May meeting of the Richmond Railroad Club.

Some inventors have brought out special forms of annular exhaust pipes with tops on them like the rose of a watering pot, with induced currents of gas passing up through them, etc., and reports have been published which show 10 or 15 per cent. saving.

Assume that there is no fallacy in what has been said about these savings, and that they be all applied to one engine, and put a good man on and you will have about 30 per cent. more coal on hand at the end of the trip than when he started. Now, some of these things are all right, provided they are used intelligently and under the right conditions, but you have always got to count the other side of the bill. Does the saving to be effected in coal pay for the increased cost of maintenance, the increased loss of time through engine failures; not only

Metallic Flexible Joints.

Two Martin metallic flexible joints, designed to give a tight flexible connection in places where movement and vibration occur between connecting parts, are shown in the illustrations. Fig. 1 is a "pressure" joint, and it will be noted that tightness does not depend on a ground joint or abrasive wearing parts; instead, the ball rides in

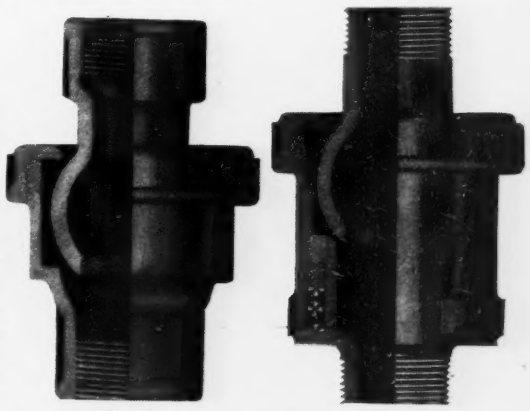


Fig. 1. *Fig. 2.*

Martin Metallic Flexible Joints.

a seat of hard-moulded non-metallic gaskets, which are interchangeable and self-lubricating. The wear is taken by the front gasket, the ball being forced against this gasket when the pressure is on. When the front gasket is worn out and begins to leak it can be interchanged with the rear gasket. The joints are made of hardest bronze metal and their independence of a ground seat removes the trouble and expense of regrinding. There being no wear on the joints they should last many years.

Fig. 2 is a "liquid" joint, being intended for oil, water and other liquids. The two gaskets are kept in contact with the ball by a spring, which is protected from contact with the liquids passing through. The joint may therefore be used for all classes of liquids.

These joints are adaptable to a large number of uses and permit a wide range of movement where several of

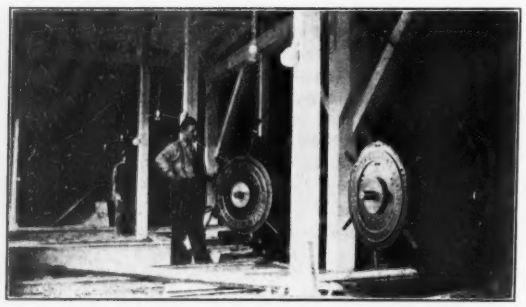
them are used with suitable lengths of pipe. They are in general use for steam-heat connections between locomotives and tenders, and on Lidgerwood unloaders, steam shovels, steam hammers and in quarries, mines and railroad shops and yards; also for high-pressure and hydraulic work. They are made in all sizes by the Holland Company, 77 Jackson Boulevard, Chicago; 12 Fremont street, San Francisco, Cal., and 26 Cortlandt street, New York.

The Great Northern Triangular Ties.

In our issue of May 22 we printed a short account of the triangular ties now being made for the Great Northern. Through the courtesy of Mr. William Henry, manager of the company's plant at Somers, Mont., we have been furnished with additional information. Owing to the increasing scarcity of timber, though it is perhaps felt as little on the Great Northern as on any road in the country, any method which can increase the area covered by a given amount of the wood is of much interest.

General View of Plant at Somers.

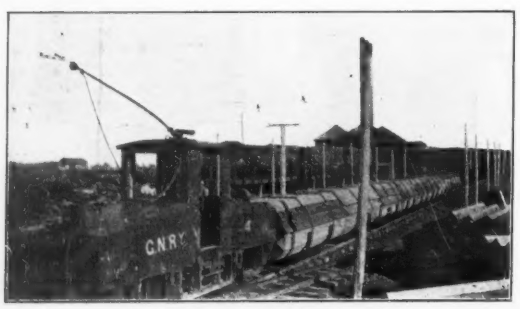
All of the ties treated at the Somers plant, where the zinc-tannin process is used, are sawed by the John O'Brien Lumber Co.'s double band mill, about half a mile from the plant. This mill started sawing the triangular shape in September, 1901, and has sawed, to date, about 871,000 ties. All of the Great Northern standard shapes, cross sections of which were shown in our previous article, are made at the O'Brien mill, but full 85 per cent. of the present output are cut triangular. So far, they have all been used for renewals, principally on the Montana, Kalispell and Cascade divisions of the



End of Preservation Cylinders.

main line, and on the Montana Central. These ties are cut mostly from tamarack and bull pine, with a small percentage of white spruce and of Douglass fir, and the cross section of the stick is either 10 in.x10 in., furnishing two triangular ties, or 14 in.x14 in., furnishing four ties. The amount of timber, b. m., in a triangular tie cut from either size stick is approximately 32 ft., as against 42 ft. for a tie 8 ft. long and 7 in. x 9 in. cross section, with round sides, and about 37 ft. for a tie with square cross section, 7 in.x7 in.

A question which naturally suggests itself is whether



Train Load of Triangular Ties.

or not the spikes would tend to become loosened after several winters of service, owing to shimming, and the diminished hold afforded by the receding lower surface of the tie. It is thought, however, that with the standard spike, and with judgment used in staggering, there is no occasion for this. Moreover, the Great Northern uses tie plates on all ties put in, which does away with promiscuous spike driving. No loose spikes have yet been reported from ties laid in the early part of 1902. The preservation process, known as the Wellhouse, or zinc-tannin method, was fully described in the *Railroad Gazette*, May 30, 1902. Three separate solutions are injected into the ties, under pressure; the first being zinc-chloride, then gelatine or glue, and then tannic acid.

The accompanying illustrations show a trainload of triangular ties, a general view of the Somers plant, and the end doors of the cylinders.

A Concrete Railroad Tie.

G. M. Burbank, General Manager of the Hecla Belt Line, Bay City, Mich., has recently secured a patent on a concrete tie which is shown in the accompanying engraving. A number of these ties have been placed under the track of the Hecla Belt Line and after a care-

Concrete Railroad Tie.

ful examination following several months' of service they have been found to be satisfactory in every respect.

The tie consists of a cement body (1) moulded around a stiffening frame work composed of a twisted tie bar (2) and an upwardly bowed stiffening plate (3) supported at either end by wooden blocks. The blocks extend above the surface of the concrete and form a resilient support for the rails. The twisted tie bar has broad plates welded to each end which cover the wooden blocks and form tie plates. The plates have two holes in them through which spikes are driven to hold the rails to the blocks. Since the rails are spiked through these tie plates, which are an integral part of the twisted bar, they are securely held to gage and prevented from spreading. The wooden blocks projecting above the cement allow for considerable wear before the upper surface is low enough to let the rail touch the cement body. The lower stiffening plate has upwardly projecting pins at each end under the wooden blocks. These separate the ends of the plate from the blocks and hold the parts of the stiffening frame in the proper relative position while moulding the cement body. The under surface of the cement body is arched upward in a curve parallel to the stiffening plate to reduce the size and weight.

Foreign Railroad Notes.

The *Annalen für Gewerbe und Bauwesen* for July 1, 1903, contains an address upon the German railroad now building in China, made at a recent convention by one of its Directors. Soon after the Chinese-German treaty of 1898, German capitalists undertook the construction of a railroad in the province of Shan Tung, to extend inland from the seacoast. Work was begun in the fall of 1899, but was necessarily seriously interfered with by the later Boxer movement. By the end of 1901 nearly 100 miles were in operation; at present the mileage in operation is 225; and the prospective length of the railroad system when complete is 350 miles. The frequent water courses necessitated many bridges and culverts, which were all substantially built of iron and steel. The usual difficulty peculiar to China was met in acquiring land at the time given up to grave yards. But the Chinese respect for ancestors did not prevent the owners from accepting a fixed price of $2.50 per grave—whether containing one or many bodies. Improved cattle-guards were found necessary to prevent the Chinamen from driving their carts on the roadbed. Steel rails of 60 lbs. to the yard were used; as well as metal ties. The construction and equipment are all German, barring the wood used, which was imported from Corea and this country. German locomotives, freight cars (15 ton), and passenger cars are all of German pattern adapted to Oriental conditions. The financial prospects are not brilliant, as the population, though dense, is poor, and commerce is not extensive.

TECHNICAL.

Manufacturing and Business.

H. D. Kyle, Vice-President and General Manager of the Universal Car Bearing Company, Chicago and New York, has resigned.

Archibald M. McCrea has been elected President of the Union Spring & Manufacturing Co., of New Kensington, Pa., succeeding Leonard G. Woods.

E. H. Barnes, heretofore Superintendent of Terminals of the Southern Railway at Jacksonville, Fla., has gone to Atlanta, Ga., to become Southern Sales Agent for the Bass Foundry & Machine Company, Lenoir City, Tenn.

The Cleveland City Forge & Iron Co., of Cleveland, Ohio, maker of heavy forgings, is building an addition to its plant and has placed a contract with the Garry Iron & Steel Company, of Cleveland, for the structural material for the building.

The Butler Foundry & Machine Co. has been organized at Butler, Pa., and will build a plant at that place to make gray iron, malleable and steel castings and also some railroad specialties. Contracts for the buildings and equipment are being let.

An officer of the American Car & Foundry Company writes that its steel car plant recently completed at Berwick is a practical duplication of its plant at Detroit, Mich., as already described and illustrated with a double page inset in our columns of June 13, 1902, page 423.

The Chicago & North Western is sending out an attractive little booklet descriptive of Omaha, Council Bluffs and South Omaha. It gives information relative to the historical, civic and commercial growth of these cities and is gotten up in good taste with excellent illustrations.

The American Railway Traffic Company has been incorporated with a capital stock of $1,000,000 by H. Milton Kennedy, Brooklyn; Chas. I. Taylor, New York, and J. Haviland Tompkins, Jersey City, to transact a general freight transportation business over the existing lines of street and steam railroads.

F. L. Dame, for the past two years General Manager of the Union Electric Company, of Dubuque, Iowa, has accepted the position of engineer of the local companies' committee of the General Electric Company. Mr. Dame's headquarters will be at Schenectady, and he will take up his new duties about the middle of August.

A charter has been granted to the Ohio Valley Steel Foundry Company of Pittsburg, Pa., with a capital stock of $150,000. The company will build a steel casting plant at Paden, W. Va., north of Sistersville, to make a specialty of railroad castings, with a daily capacity of 40 tons. D. L. Hirschfield, of Pittsburg; C. G. Robbins, Cincinnati, and others, are incorporators.

A. M. Mosscrop has resigned as Vice-President and General Manager of the Baltimore Bridge Co., Baltimore, Md., and accepted the office of General Manager of the bridge and structural shops of Dorman, Long & Co., Limited, of Middlesborough, England. Lawrence Ennis, formerly Assistant Superintendent of the Rochester (N. Y.) plant of the American Bridge Company, will go to England as superintendent.

Iron and Steel.

The British Iron Trade Association has published statistics which show that the production of pig iron was 8,517,693 gross tons in 1902, as compared with 7,851,830 tons in 1901, 8,908,570 tons in 1900 and 9,305,319 tons in 1899. The production of open hearth steel ingots declined from 3,290,791 tons in 1901 to 3,083,288 tons in 1902. The production of Bessemer steel ingots was 1,825,779 tons in 1902, as compared with 1,606,253 tons in 1901.

Turbo-Generators.

Sealed proposals will be received by the Fifth Vice-President of the New York Central & Hudson River, Mr. Wilgus, 3 p.m., Sept. 1, 1903, for the furnishing, delivery and erection of from six to 12 turbo-generators.

A Steel Castings Plant for Newport News.

Press despatches from Newport News, Va., say that the Newport News Shipbuilding & Dry Dock Co. announces that it will soon begin to make steel castings in a plant very near its yards, in which all except the largest castings used in shipbuilding will be made.

Gun Carriage Contract.

The Ordnance Bureau of the War Department let contracts on Aug. 1 for 15 disappearing gun carriages to the Detrick & Harvey Co., of Baltimore, Md., at $10,871 each, and for five disappearing gun carriages to the Mansfield Engineering Company, of Mansfield, Ohio, at $10,250 each.

Potomac River Improvements.

In response to a request for bids for dredging 480,000 cu. yds. of material from the Potomac River from various points about the city of Washington, D. C., only one bid was received, from the Atlantic, Gulf & Pacific Company, which bid $62,400 for the entire work, part of the work above long bridge to be done at 12⅘ cents per cu. yd. and part lower down the river at 15 cents per cu. yd.

Addition to Rogers Locomotive Works.

The Rogers Locomotive Works, Paterson, N. J., is putting up a tank and tender shop 200 x 185 ft. It will have along one of its 200 ft. sides a 25-ton traveling crane for handling tanks, tender frames, trucks, etc., during building and completion. Contracts have been let and the work is in progress. This is the only extension contemplated by the company notwithstanding reports to the contrary.

The Wabash Pittsburg Station.

Work is now going on rapidly on the passenger station for the Wabash in Pittsburg. The excavation has been completed and work on the foundations started. The general contract has been let to the George A. Fuller Company. The iron and steel work has been sublet to the American Bridge Company, which already has about $2,500,000 of Wabash extension work. The granite for the station building will be furnished by the Maine & New Hampshire Granite Company, and the Bedford stone facing and trimmings by Morrison Brothers, of Pittsburg. The woodwork, fireproofing, plumbing and some other contracts are yet to be let. The structure was

described and illustrated in the *Railroad Gazette*, Nov. 7, 1902.

Improvements at Camden, N. J.

As soon as the summer travel to Atlantic City is over, both the Pennsylvania and the Atlantic City (P. & R.) Railroads will improve the lines in and around Camden. The West Jersey & Seashore (Pennsylvania) intends to elevate its tracks; the Atlantic City R. R. will depress its tracks so as to pass under the West Jersey & Seashore, which will do away with a dangerous grade crossing and also allow the Atlantic City road to save time, as the trains will not have to slow down to cross these tracks. A number of buildings have already been demolished by the Pennsylvania for this work. The Atlantic City road will also make a number of changes at its Bulson street yards. Additional tracks will be laid and a large freight house built.

The Wheeler Forged-Rolled Steel Wheel.

Mr. Frank A. Wheeler, of Pittsburg, Pa., has patented a process of making a one-piece steel wheel and organized a company for its manufacture. For a 33-in. wheel he uses an ingot about 16 in. in diameter, and with steam hammer and hydraulic press forges the ingot until the hub and web are brought to practically the finished size. It is then subjected to a process of heat treatment which he calls muffling, so that the outer portion of the wheel is brought to a rolling heat while the web and hub is kept at a lower red heat. The rolling process for bringing the wheel to its final shape is quite interesting. Mr. Wheeler was formerly connected with the steel tire departments of the Midvale and Latrobe companies. The address of the Wheeler Forged-Rolled Steel Wheel Company is at Pittsburg, Pa.

Heating and Ventilating of Pennsylvania Steel Company's Shops.

The Pennsylvania Steel Co. has recently built at Steelton, Pa., a large shop and office building for its bridge and construction department. Buildings of this nature offer many difficulties in heating because of the height of one story and the rapid rate at which heat is transmitted through single walls and skylights. A long and extended system of piping involves many fixtures and joints to keep tight, gives rise to danger from fire where unprotected pipes pass near wood or other inflammable material, and is subject to damage by freezing in severe cold weather. Moreover, it does not deliver the heat where it is most needed. Ventilation by this method of heating is uncertain and unsatisfactory. The above objections are obviated in the fan and heater, or "hot-blast" system, which has been adopted in these buildings. In this system the steam piping is concentrated in a compact heater, which is enclosed by a steel housing. Due to the greater velocity of the air over the pipes of the heater, much less length of pipe is required than if the piping were scattered throughout the shop. Air taken either from the shop or from out-of-doors is forced through the heater by a fan and is then carried to various points about the shop by a system of galvanized iron piping. The exhaust from the fan engine is condensed in a section of the heater arranged for that purpose. The distribution of the heated air in the shop is important. The hot air should be delivered so that there is no perceptible draft upon the workmen, but at the same time the outlets should be placed at short intervals and directed towards the floor. By this means it has been found possible, as in the works of the New York Shipbuilding Co., at Camden, N. J., to keep a zone of 9 or 10 ft. in height comfortably warm, while the space overhead is in comparatively free communication with the outside air. In the bridge and construction shops of the Pennsylvania Steel Company there are eight fan and heater sets, consisting each of a steam-coil heater and a steam-engine-driven exhaust wheel. The apparatus was furnished by the B. F. Sturtevant Company. The sections rest on heavy wrought-iron bases with provision for contraction and expansion. The fans are enclosed in three-quarter, steel-plate housings, the lower part of the fan scroll being underground and forming a part of the foundation. They are driven by direct-connected, horizontal, side-crank engines. A system of galvanized-iron piping distributes the air throughout the buildings, the air being discharged through branch drop-connections having outlets near the floor. The ducts are large with bends of long radius to reduce frictional losses. The apparatus will heat the buildings to 65 deg. F. in zero weather.

THE SCRAP HEAP.

Notes.

On Thursday, July 3, the day of the funeral of the late President Kimball, of the Norfolk & Western, all trains on that road were brought to a standstill at 10:45 a.m., and kept standing for 10 minutes, out of respect to the dead officer. Work was suspended in all departments.

The Texas Railroad Commission on August 1 ordered a new tariff of express rates which will cause a reduction of as much as 10 per cent. in the rates now in force and will occasion a heavy decrease in the gross receipts of express companies operating within the State. These companies are also required to maintain general offices in Texas.

The New Orleans Maritime & Merchants Exchange has issued a statement to the effect that during the year ended July 1, 1903, a total of 31,121,456 bushels of grain cleared from the port of New Orleans, breaking all previous records. Of the entire amount 17,289,279 bushels were wheat, 13,717,487 bushels were corn, and 114,690 bushels were rye. Rather more than five-sixths of the total quantity cleared was inspected by the grain inspection department of the exchange for export.

At the time of the recent machinists' strike at the La Junta shops of the Atchison, Topeka & Santa Fe the shops were closed rather than to concede the demands made and it was announced that they would probably be permanently discontinued and the work done at Topeka. According to recent advices, however, the anticipated moving of the shops will not be attempted now, and the La Junta strikers have been taken back in the service conditionally. It is said that only those who are property owners at La Junta will be reinstated, and only after personal application. Overtures made by officials of the Order of Machinists to have the men taken back in a body were rejected by General Manager H. U. Mudge. It is proposed to do the heavy work for the present at Topeka.

According to estimates made by passenger officers at St. Paul the total number of settlers passing through St. Paul for the Northwest this year has been 130,000. Of these 85,000 went to points in Minnesota, North Dakota, Idaho and Washington. The rest went to the Canadian Northwest. According to these estimates, the traffic was divided about as follows: Northern Pacific—To points in the northwestern States, 45,000; to points in Canada, 10,000. Great Northern—To points in the northwestern States, 30,000; to points in Canada, 10,000. Other lines—To points in Minnesota and North Dakota, 10,000; to points in Canada, 25,000. The movement was not more than two-thirds as large as last year, owing to the fact that the price of land has risen to $18 and $20 an acre.—*Press despatch.*

Interlocking.

The Erie road has let to the Union Switch & Signal Company the contract for a manual interlocking plant at Long Eddy, N. Y.; the frame to have 20 spaces and the number of working levers to be 18. This interlocking is at a meeting point where there are two long sidings and a crossover. Though the principal functions are to be performed manually there are four signals to be worked by electric motors; two distant and two advance or starting.

Signal-Men's Improvement Association.

The Terminal Towermen's Association of Tower No. 1, Central Railroad of New Jersey, is an organization formed for the purpose of social and technical advancement. It is the intention to form an organization consisting of all the towermen on the road, so that they may become familiar with the technical side of interlocking and study from observation as well as from the various experiences and difficulties met with in their line of work.

Automatic Switch for Electric Roads.

The Interurban Street Railway Company is experimenting at Lenox avenue and 116th street, New York City, with a switch operated by electric power. The car is stopped at a specified point near the frog and by applying the brake and throwing over the controller handle a connection is established between the electric plow and a device in the conduit which throws the switch. Experiments will be continued throughout the winter before it is put in service elsewhere on the line.

Railroad Bridge Dynamited in Montana.

An attempt was made to destroy the long bridge spanning the Yellowstone River at Butte, Mont., on August 2. A large amount of dynamite was set off at the main pier in an effort to wreck the North Coast Limited train of the Northern Pacific, but the bridge was not greatly damaged and the train passed over it in safety. A threatening letter had been received by the company the week previous, written by a man who demanded $5,000. The company has offered a reward of $1,000 for the arrest of the dynamiters.

Annuity Granted as Damages for Injuries in Railroad Accident.

The royal court at Frankfort has awarded a life annuity of 17,000 marks ($4,048) to a physician of Lauterbach for injuries received in a derailment in 1897. The Royal Prussian Railway management acknowledged its liability, but not to the extent of damages asked. The doctor brought suit, with the result that the court awarded him the annuity on the ground that the plaintiff had a large practice and was widely known as an operating surgeon.—*Consular Reports.*

Chesapeake & Ohio Train Held up at Clifton Forge.

A mob of 200 armed men held up an express train on the Chesapeake & Ohio, near Clifton Forge, Va., on July 31, and attempted to take a couple of negroes from the train and lynch them. The train was flagged and the engineer covered with a revolver when he stopped. A number of shots were fired into the car where the negroes, who were under arrest, charged with shooting a Chesapeake & Ohio brakeman, were riding. The prisoners, and a few other passengers in the car, lay on the floor and were not injured, although almost every window in the car was broken. After the shooting began the engineer took advantage of an opportunity and opened the throttle. The train pulled out safely and no one aboard was injured.

The Station Agents' Association.

The National Association of Railway Agents met in St. Louis on July 20 and were shown over the World's Fair grounds and then went in a body to Eureka Springs, Arkansas, where a convention was held. They were welcomed by the Mayor and addressed in cordial terms by railroad officers. The papers read related to pension systems and agents' duties. The papers were naturally not at all technical. For example, the Secretary's paper on Promotion contains the following directions: "Hope, hand in hand with effort, will win the hardest fight, as nature's dawn will scatter the darkest kind of night: Strife holds the lower ladder, the top is for the few, so fight your way to favor—it's up to you." The officers of the association are: President, W. H. Mills; Treasurer, J. F. Gray; Secretary, N. A. Cottrel, agent of the St. Louis, Iron Mountain & Southern, at Bismark, Mo.

Long Distance Run of a Battleship.

The battleship "Kearsarge" reached Frenchman's Bay, Me., on July 26, after crossing the Atlantic from Portsmouth, England, under orders to make the best possible speed under natural draft. The official report of Capt. Hemphill, U. S. N., commanding the ship, says that she left the Needles at 1:30 p.m., on Friday, July 17, and arrived at Mount Desert Rock at 12:45 p.m., on Sunday, July 26. The total distance run was 2,885 miles, and allowing for the difference in longitude the actual running time was 9 days, 4½ hours, giving an average speed of 13.1 knots per hour for the entire run. For the whole distance the ship met head winds, head seas and currents, and also encountered a gale and later icebergs, making it necessary to slow down her engines to 10 knots for 10½ hours. On the run 1,230 tons of coal were used, an average of 135 tons a day, and she reached port with 410 tons on board, having started from Portsmouth with 1,640 tons, or 50 tons on deck beside her bunker capacity. In 53 days since leaving the United States, the ship steamed 8,200 knots, and was at sea 24 days, without a single accident to her machinery.

Material for Egyptian Railroads.

Consul-General Richard Guenther reports to the government from Frankfort that the Austro-Hungarian Chamber of Commerce of Alexandria has published statistics showing that the total value of material ordered for the Egyptian State Railroads during 1902 amounted to $3,757,239. England supplied by far the greatest amount, to the value of $2,565,528. Belgium was second in the list, with supplies valued at $488,850, and the United States was tenth, with value of $34,393. Trucks were formerly purchased from the United States but are now ordered of Hungary in preference. Favorable comment is made on the design of the American locomotives, but it is observed that they require very large quantities of coal. The majority of the rolling stock was purchased in England, Belgium and Austria. The Chamber of Commerce reports that the American cars have proved less durable, excepting those which were furnished for the narrow gage line between Luxor and Assuan, which met all requirements. The Hungarian freight cars are giving satisfaction in every way and Hungarian passenger coaches are favorably mentioned, although not considered entirely satisfactory.

Railroad Astronomy.

The long experience of Mr. W. H. Rosevear, of the Grand Trunk Railway, in tracing cars on foreign roads has well fitted him for the following stellar study with which he has favored the *Railroad Gazette*:

Astronomers tell us that our nearest neighbor—outside of our planetary system, is Alpha Centauri, a star which may be said to hang in space just at the threshold of the vast stellar universe, and is distant from us three and a half light-years (light traveling at the rate of 190,000 miles per second), or about 20 billions of miles. These figures are so tremendous that they fall upon the mind like a heavy weight, and it may be that a railroad comparison will aid somewhat in its proper comprehension. So let us take our seats in a cannon-ball train for a friendly call on A. C., the train being scheduled to move at 50 miles per hour—without stops—day or night. The Moon, 219,000 miles on the way, is reached in six months; the Sun, 95 millions of miles distant, in 2,000 years; and we arrive at Neptune, at the extreme limit of our solar system, a distance of 285 millions of miles, in 6,000 years. But to reach our neighbor, the nearest fixed star, Alpha Centauri, our train must run uninterruptedly and at uniform speed for 42 millions of years. Having survived this, we have merely gained a slightly better vantage point, from which to view some additional myriads of those wonderful luminous worlds, with which the Almighty Creator has beautified the vast infinity of space.

Shipping Notes.

The Suez Canal Company reports that the net tonnage which passed through the canal during the year 1902 was 11,248,413 tons, as against 10,823,840 tons in 1901, and 9,738,152 tons in 1900. Gross receipts were $20,621,993 in 1902, $19,902,377 in 1901, and $18,036,121 in 1900, and net earnings were proportional; the expenditures in 1902 being $8,140,393. Nearly four times as many British ships passed through the canal as those of any other nationality; German ships being second in the list.

The Hamburg-American Packet Company has made

Dover, England, a port of call for its various lines running through the English channel. Southampton, Plymouth and Cherbourg have, from time to time, been used for this purpose. The North German Lloyd steamships also stop at Plymouth and Cherbourg, at present.

A considerable increase is reported in the number of sea-going vessels running during the present season to Montreal. Up to July 20, 344 had arrived from foreign and gulf ports as against 313 during the same period last year, showing an increase of 31 vessels in the first half of the shipping season. Increased sailings and better service is reported on the Dominion, Furness-Withy and Leyland lines.

The Northern Pacific Steamship Company announces that the Asiatic steamship lines from the Pacific Coast will maintain the cut rate of $3 on flour to the Orient during August. The cut rate on wheat has been fixed by representatives of the different lines of Puget Sound and Portland at $5 per ton. The low rate on flour was made temporarily last June to meet a rate made by the China Commercial Company from San Francisco.

Proposed Ship Canal Across Scotland.

Consul Rufus Fleming reports to the government from Edinburgh that a syndicate at that place has pledged £10,000,000, in conjunction with a London syndicate, to build a deep water canal across Scotland from the Firth of Forth to the Clyde, on condition that Parliament will guarantee interest on the capital, in view of the importance of the canal for naval purposes. There are at present two canals connecting the east and west coast of Scotland; one, known as the Forth-Clyde, running from Grangemouth on the Firth of Forth to Bowling on the Clyde, which is chiefly used by barges, and the other, the Caledonian canal, which was built by the government, and extends from Inverness to Fort William, connecting a chain of lakes. The maximum length of vessel which can get through the locks on the Caledonian canal is about 150 ft., with 38 ft. beam and 17 ft. draft. All larger vessels bound from one coast of Great Britain to the other must now pass either through the crowded English Channel or through the dangerous Pentland Firth, on the north, between Scotland and the Orkney Islands, where the tides run at times from seven to eight knots and there is much danger from uncertain currents and fogs. The proposed canal is projected along a route starting from Alloa on the Firth of Forth and running westward along the valley of the Forth, where the surface of the ground is only from 30 to 50 ft. above mean sea level. It will be necessary to go over some high country between the end of this stretch and Loch Lomond, which it is proposed to use for a portion of the route. At the west end of Loch Lomond a strip of difficult country a mile and three-quarters across must be traversed to reach Loch Long, which is an inlet of the Atlantic.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

The American Street Railway Association.

The 22nd annual meeting of the American Street Railway Association will be held at the Grand Union Hotel, Saratoga Springs, N. Y., Wednesday, Thursday and Friday, September 2, 3, 4. The list of subjects to be presented embraces:

1. "Steam Turbines."
2. "Electric Welded Joints."
3. "The Evils of Maintenance and Champerty in Personal Injury Cases."
4. "Train Orders and Train Signals on Interurban Roads."
5. "Freight and Express on Electric Railways."
6. "The Manufacture and Distribution of Alternating Currents for City Systems."
7. "Comparative Merits of Single and Double Truck Cars for City Service."
8. "The Right of Way."

PERSONAL.

—Mr. J. E. Irwin, Master Mechanic of the Marietta, Columbus & Cleveland, whose jurisdiction has been extended over the Little Kanawha, spent the early part of his life near Parkersburg, where he learned the trade of machinist in the Ohio River shops. He became machinist for the Toledo & Ohio Central at Corning, Ohio. He was then promoted to the Kenton shops as foreman and afterward was made General Foreman of the Columbus shops, where he was until he went to Marietta as Master Mechanic of the Marietta, Columbus & Cleveland.

—Mr. T. S. Davant, whose appointment as Freight Traffic Manager of the Norfolk & Western was recently announced, has been in railroad service since 1865; beginning in that year as station agent for the Charlotte & South Carolina at Fort Mills, S. C. In 1869 he went to Columbia, S. C., as agent for the Columbia & Augusta, and for the two years following held a similar position on the Charlotte, Columbia & Augusta. In 1871 he was made chief clerk to the General Freight and Passenger Agent, and from 1874 to 1877 was General Freight and Passenger Agent on the Port Royal. Then Mr. Davant went to Memphis, Tenn., as Assistant General Freight Agent on the Memphis & Charleston. In February, 1886, he resigned to go to the East Tennessee, Virginia & Georgia as General Freight Agent, and in May, 1892, he was appointed General Freight Agent of the Norfolk & Western, and he has filled that position until now.

—Mr. Charles J. Parker, M. Am. Soc. C. E., who on Monday of this week became Assistant to the Chief Engineer of the New York Central & Hudson River, was born in Jefferson County, N. Y., in 1865. He graduated from Lehigh University (civil engineer) in 1888, and shortly after went to the Lehigh Valley as a rodman, where he served three years in the engineering department. From 1892 to 1893 he was Resident Engineer of the Buffalo, Rochester & Pittsburgh, and for the next three years he located lines in St. Lawrence County and also for the B., R. & P. in Pennsylvania. For a time he was employed as Assistant Engineer of the Terminal Railway of Buffalo. In 1896 he resigned and went back to the company where he had had his early railroad experience, the Lehigh Valley, as Division Engineer of the Auburn Division, and was there until 1898. From there he went to the New York Central & Hudson River as Division Engineer of the Rome, Watertown & Ogdensburg Division and stayed until 1902, when he went to Rutland as Chief Engineer of the Rutland Railroad. Mr. Parker now comes from Rutland to New York city to assume his new duties as above.

—Mr. Theodore H. Curtis, who has been appointed Superintendent of Machinery of the Louisville & Nashville, to succeed the late Mr. Leeds, was born at Terre Haute, Ind., on Aug. 12, 1866. In 1886 he became Chief Draughtsman of the Cleveland, Cincinnati, Chicago & St. Louis at Cleveland, Ohio. He went to the Brooks Locomotive Works in 1888, and the Pittsburg Locomotive Works in 1889, leaving the latter place to become Chief Draughtsman of the New York, Chicago & St. Louis in June, 1889. He was appointed Mechanical Engineer of the same road in 1897, and held this office until, in 1899, he became Mechanical Engineer of the Erie Railroad. Jan. 1, 1901, when the Louisville & Nashville was building a large shop at Louisville, Ky., he was appointed their Mechanical Engineer and so served until his appointment to be Superintendent of Machinery on Aug. 1, 1903.

—Mr. Edward D. Nelson, who on August 1, became Engineer of Tests of the Pennsylvania Railroad at Altoona, is 45 years old. He was born in New York city and was graduated from Yale (Sheffield Scientific School) in the class of '79. He is also a graduate from the intensely practical scientific school of the Pennsylvania at Altoona. After leaving Yale he spent a year in European travel and then served a short apprenticeship in the machine tool manufacturing firm of Wm. Sellers & Co., of Philadelphia. In October, 1881, he went to Altoona and completed the term of his apprenticeship in the machine shop. While there he was, as he expresses it, "fortunate to be under the direction of Mr. Jno. W. Cloud in the testing laboratory." In May, 1885, he was transferred to Williamsport as Superintendent of Motive Power of the Philadelphia & Erie Railroad Division and of the Northern Central Railway. These offices he has held for the past 18 years. The change should be agreeable to one of Mr. Nelson's habit of mind, for he is well equipped with all the information adapted to this new position, and in addition he has the judicial quality.

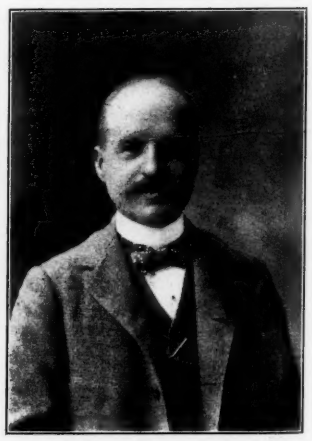
—Mr. A. B. Youngson, who became the head of the Brotherhood of Locomotive Engineers upon the death of Mr. Arthur, died at Meadville, Pa., July 30. Mr. Youngson was, until the death of Mr. Arthur, Assistant Grand Chief of the Brotherhood.

—Mr. Alexander Robertson, who has become Manager of the Western Maryland and the West Virginia Central & Pittsburg (these two roads are now controlled in the Wabash interests), is about 43 years old. Mr. Robertson entered railroad service in 1885 as a passenger brakeman on the Fitchburg Railroad, and was successively with this company in various capacities until 1897, when he went to the Wabash as General Yardmaster. The following year (1898) he was promoted to be Trainmaster, and in September, 1899, was appointed Division Superintendent at Decatur, Ill., which position he now resigns to go to the Western Maryland.

—Mr. Joseph E. Gould, who goes from Chattanooga, Tenn., to Lima, Ohio, as Master Mechanic on the Cincinnati, Hamilton & Dayton, was born at St. Simons Mills, Glynn County, Ga., in 1866, and has been in railroad service since 1881. He began as an apprentice on the Pittsburg, Cincinnati & St. Louis, and afterward took a course in mechanical engineering at the Ohio State University at Columbus. He then went back to the Pittsburg, Cincinnati & St. Louis and was in the motive power department until 1894. From 1894 to 1898 he was Assistant to the Master Mechanic, and in September, 1898, became General Foreman of the Toledo & Ohio Central at Columbus, Ohio. From there he went to the Cincinnati, New Orleans & Texas Pacific as Master Mechanic at Chattanooga, and has been there until now.

—Capt. George M. Walker, late of the Old Dominion Line, died at his home in Brooklyn, N. Y., on July 31, aged 77. On his retirement from active life, he was the oldest captain sailing out of the port of New York. He was born at sea in July, 1826, his father being captain of the British brig "Fox." In his early career, he sailed in the "Humboldt," of the New York, Southampton and Havre Steamship Company, then on the "Washington," the "Franklin," and the "Arago." He then became captain of the "Fulton," and carried stores to Port Royal during the war in the sixties. He captured the "Margaret and Jessie" blockade runner and later another blockade runner, the "Banshee," off Wilmington, Del. The cargoes of these two vessels were sold for $520,000. Later Capt. Walker commanded the "Raleigh," "Niagara," "Albemarle" and innumerable other well-known steamers. While on the "Albemarle" he received a gold medal for rescuing the crew of a wrecked schooner. He lead an active life and retained to the very last years of his seafaring life his mental and physical faculties. He was held in high esteem by all the officers of the Old Dominion Steamship Co. with whom he was connected for so many years, and was respected by all who came in contact with him.

—Mr. Thomas H. Pindell, the new Superintendent of the Wyoming Division of the Lehigh Valley, was for a number of years Superintendent on the Erie. He was born in 1860, and has been in railroad service since early boyhood, beginning as an operator for the Springfield & Illinois Southeastern. In 1876 he went to the Wabash; from 1877 to 1879 was on the Ohio & Mississippi; then for a few years he was with the Western Union Telegraph Company. In 1881 he went back to the Ohio & Mississippi as Secretary to the Superintendent, and remained with this company for several years. For about 10 years Mr. Pindell was on the New York, Lake Erie & Western, and its successor, the Erie, as clerk, chief despatcher, chief clerk to the Superintendent of Transportation, and in 1897 was promoted to be Superintendent.



—Mr. J. W. Dawsey, who recently went to Winnipeg as Superintendent of the Canadian Northern, was born at Aylmer, Quebec, on June 10, 1861. His first railroad experience was with the Flint & Pere Marquette in 1883, when he was telegraph operator, and from then until 1886 he held minor positions, despatcher and chief clerk in the Superintendent's office. In December, 1886, he went to Ottawa as agent for the Canada Atlantic, and became chief clerk at Montreal and Toronto. For

about a year he was agent for the National Despatch Fast Freight Line at Toronto. From 1893 to 1897 Mr. Dawsey was General Manager of the Quebec Southern with office at Montreal. In December, 1897, he resigned to go to the Canadian Pacific as freight agent, and was with this company until July, 1901, when he went to Sault Ste. Marie as Superintendent of the Algoma Central and stayed there until June, 1903, when he became Superintendent of the Canadian Northern at Winnipeg.

—Mr. F. A. Lattig, Superintendent of the National R. R. of Mexico at Matamoros Tamaulipas, Mexico, was born at Delano, Pa., on May 25, 1870. In 1876 he went to Freeport, Ill., and lived on a farm until 1887, when he entered the service of the Lehigh Valley as a digger in a floating telegraph repair gang. After learning to climb and, having learned telegraphy, he was appointed division lineman of the Lehigh Division in April, 1888. In November, 1888, he was appointed telephone inspector of all telephones on the Eastern Division. From June, 1889, he took charge of the electric lighting plants on the Eastern Division, until December, 1889, when he went to the National R. R. of Mexico as chief lineman of the Northern Division. After rebuilding the telegraph lines betwen Saltillo and Monterey, Mexico, he became a freight brakeman, freight conductor, and passenger conductor. He was train despatcher from December, 1895, to December, 1896, when he returned to the Lehigh Valley as signal inspector of the Hall automatic electric block signals. In January, 1898, he went back to the National of Mexico and served as conductor, yardmaster and despatcher until April 1, 1902, when he was appointed trainmaster of the Northern and Texas Mexican Divisions, with office at Laredo, Texas, where he remained until his promotion as above.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—A. Dinan has been appointed Master Mechanic, with headquarters at Newton, Kan., succeeding W. S. Grandy. C. H. Bristol, hitherto Trainmaster, has been appointed Superintendent, with headquarters at Pueblo, Colo., succeeding F. T. Dolan.

Canadian Northern.—W. Pratt, Jr., has been appointed Superintendent of Sleeping and Dining Cars and News Department, with office at Winnipeg.

Cleveland, Cincinnati, Chicago & St. Louis.—M. A. Neville, hitherto Engineer of Maintenance of Way, has been appointed Superintendent of the Peoria & Eastern Division, with headquarters at Indianapolis, succeeding M. D. Schaff, resigned.

Paul Hamilton, Engineer of Maintenance of Way at Mt. Carmel, Ill., has been transferred to Springfield, Ohio.

Delaware & Hudson.—A. I. Culver, Third Vice-President and Comptroller, has been elected Second Vice-President, succeeding H. G. Young.

Evansville & Terre Haute.—C. W. Hillard, Comptroller of the St. Louis & San Francisco, has been appointed Treasurer of the E. & T. H., succeeding Charles A. Nones, resigned.

Grand Trunk.—Walter White has been appointed Terminal Superintendent, with headquarters at Toronto, succeeding D. Morice, assigned to other duties.

Hocking Valley.—See Kanawha & Michigan.

Kanawha & Michigan.—W. C. Franz, heretofore Trainmaster of the Hocking Valley, has been appointed Superintendnt of the K. & M., with headquarters at Charleston, W. Va., succeeding W. G. Christmas, resigned.

Little Kanawha.—J. E. Irwin, Master Mechanic of the Marietta, Columbus & Cleveland, has also been appointed Master Mechanic of the Little Kanawha.

Louisville & Nashville.—Theodore H. Curtis, hitherto Mechanical Engineer, has been appointed Superintendent of Machinery, succeeding Pulaski Leeds, deceased. The position held by Mr. Curtis has been abolished. Harry Swoyer, hitherto General Master Mechanic, has been appointed Assistant Superintendent of Machinery, with authority to act for Mr. Curtis in all matters pertaining to locomotive service, distribution of motive power, and operation of shops.

Marietta, Columbus & Cleveland.—See Little Kanawha.

Michigan Central.—S. B. Wight, hitherto Assistant Purchasing Agent, has been appointed Purchasing Agent, succeeding J. R. Dutton, resigned.

Mississippi River & Bonne Terre.—General Manager J. Burns having resigned, the following appointments have been made: T. U. Young, Superintendent, will assume charge of operation; F. J. Thomure, General Freight and Passenger Agent and Purchasing Agent; George A. Nees, Auditor, in place of Mr. Thomure, and C. H. Fake, Chief Engineer.

Missouri Pacific.—J. Russell has been appointed Superintendent of the Western Division and Central Branch Railway, with offices at Atchison, Kan., succeeding H. G. Clark, resigned. J. L. Gogerty has been appointed Superintendent of Terminals, with headquarters at Kansas City, Mo., succeeding W. S. Carson, transferred.

New York Central & Hudson River.—Charles J. Parker, hitherto Chief Engineer of the Rutland, has been appointed Assistant to the Chief Engineer of the N. Y. C. & H. R., with headquarters at New York city.

Pennsylvania.—The office of superintendent of the voluntary relief department has been moved from Trenton, N. J., to Philadelphia. The new office of the department is in the company's building at Fourth and Walnut streets formerly occupied by the general offices.

Pennsylvania Lines West of Pittsburg.—W. C. A. Henry, hitherto Assistant Engineer of Motive Power (Northwest System), has been appointed Master Mechanic of the Wellsville shop, succeeding Mr. Bishop, promoted. G. L. Wall has been appointed to succeed Mr. Henry.

Rutland.—C. J. Parker, Chief Engineer, having resigned, the duties of that office will, until further notice, be assumed by the Vice-President and General Manager. (See New York Central & Hudson River.)

St. Louis & San Francisco.—See Evansville & Terre Haute.

Vera Cruz & Pacific.—Oscar Menefee, Superintendent, with office at Vera Cruz, Mex., has resigned.

Yellow River.—T. Hurley has been appointed Auditor, with headquarters at Pensacola, Fla., succeeding C. H. Gordon, resigned.

LOCOMOTIVE BUILDING.

The Georgia Railway is having four locomotives built at the Baldwin Works.

DeFord & Co. (Boston) are having two locomotives built at the Baldwin Works for plantation service.

The Cape Government Railways are having one locomotive built at the Schenectady Works of the American Locomotive Co.

The Hocking Valley is reported to have ordered 15 locomotives from the American Locomotive Co., five of which will be built at the Brooks Works.

The Evansville & Terre Haute, as reported in our issue of July 31, has ordered two combination locomotives from the American Locomotive Co. for fall delivery. The contract was let June 27. Specifications call for weight on drivers, 148,000 lbs.; total weight, 163,000 lbs.; cylinders, 21 in. x 28 in.; diameter of drivers, 57 in.; working steam pressure, 200 lbs.; total heating surface, 2,547 sq. in.; 326 tubes of Shelby steel, 14 ft. long; length of fire-box, 114 in.; width, 41 in.; tank capacity for water, 5,000 gallons; coal capacity, 10 tons. Special equipment includes Westinghouse air-brakes, Sansom bell ringers, Tower couplers, oil headlights, Nathan Monitor injectors, McCord journal bearings, Crosby muffler safety valves, Leach sanding devices and Nathan improved sight-feed lubricators.

The Cincinnati, Richmond & Muncie order for 12 ten-wheel and five Atlantic type locomotives to be built at the Baldwin Works for February, 1904, delivery, is as follows: The 10-wheel engines will be simple, weighing 112,000 lbs. on drivers; total weight, 140,000 lbs.; cylinders, 19 in. x 26 in.; diameter of drivers, 62 in.; extended wagon-top boilers, with a working steam pressure of 180 lbs.; 321 Standard No. 12 gage tubes, 13 ft. long and 2 in. outside diameter; fire-boxes, 108 5/16 in. long and 34⅜ in. wide; grate area, 25 ft. 8 in.; tank capacity for water, 5,000 gallons; coal capacity, 12 tons. The Atlantic type engines will be simple, weighing 86,000 lbs. on drivers; total weight, 154,000 lbs.; cylinders, 19 in. x 26 in.; diameter of drivers, 72 in.; extended wagon-top boilers, with a working steam pressure of 200 lbs.; 336 Standard No. 12 gage tubes, 15 ft. 10 in. long and 2 in. outside diameter; fire-boxes, 102⅛ in. long and 66½ in. wide; tank capacity for water, 4,000 gallons; coal capacity, 12 tons. The special equipment for both includes: Westinghouse brakes, magnesia boiler lagging, Tower couplers, plain headlights, Hancock injectors, metallic piston rod and valve rod packings, Leach sanding devices, Michigan sight feed lubricators, Baldwin springs, 3-in. steel driving wheel tires and steel truck and tender wheels.

CAR BUILDING.

The Jamaica Coal & Coke Co. has ordered 300 cars from the Standard Steel Car Company.

The Cleveland, Cincinnati, Chicago & St. Louis is reported to be in the market for passenger cars.

The El Paso & Southwestern is reported to have ordered eight passenger cars from the Pullman Company.

The Norfolk & Western, according to press reports, will build 500 coal cars in its Roanoke shops for fall delivery. The cars will have a capacity of 100,000 lbs., and will have steel underframes.

The Atchison, Topeka & Santa Fe has ordered 250 flat cars of 80,000 lbs. capacity from the American Car & Foundry Co. for August and September delivery. The cars will be 40 ft. long and 8 ft. 6 in. wide, with wooden frames and underframes. The special equipment includes M. C. B. steel axles, cast steel bolsters, M. C. B. brake-shoes, Westinghouse brakes, M. C. B. brasses, Trojan couplers, Miner draft rigging and malleable iron journal boxes and journal box lids.

The San Pedro, Los Angeles & Salt Lake has ordered 250 flat cars of 80,000 lbs. capacity and 150 box cars of 60,000 lbs. capacity from the Pullman Co. The flat cars will be 40 ft. long and 8 ft. 11 in. wide. The box cars will be 36 ft. long and 8 ft. 6 in. wide. The special equipment for both includes: Simplex bolsters and brake-beams, Congdon brake-shoes, Westinghouse air-brakes, Ajax brasses, Janney couplers for flat cars and Tower couplers for box cars, National Malleable Castings Co.'s door fastenings, Dunham doors, Miner draft rigging, McCord journal boxes and lids, Chicago roofs, Pittsburg Spring & Steel Co.'s springs, Pullman standard trucks and Griffin wheels.

The Missouri, Kansas & Texas, as reported in our issue of July 24, has ordered 13 chair cars, one postal car, 21 coaches, 10 baggage cars, five combination coach and baggage cars, seven combination mail and baggage cars and six combination coach and mail cars from the American Car & Foundry Co., for March, 1904, delivery. The chair cars will be 70 ft. long, 10 ft. wide and 6 ft. 8 in. high from sill to plate. The postal car will be 56 ft. long, 9 ft. 11 in. wide and 6 ft. 6 in. high from sill to plate. The coaches will be 68 ft. long, 9 ft. 8 in. wide and 6 ft. 8 in. high, inside measurement. The baggage cars will be 65 ft. 9½ in. long, 10 ft. wide and 6 ft. 6 in. high, inside measurement. The combination coach and baggage cars will be 69 ft. 9½ in. long, 9 ft. 8 in. wide and 6 ft. 8 in. high, inside measurement. The combination mail and baggage cars will be 69 ft. 4½ in. long, 9 ft. 8 in. high and 6 ft. 6 in. high, inside measurement. The combination coach and mail cars will be 69 ft. 3¼ in. long, 9 ft. 8 in. wide and 6 ft. 8 in. high, inside measurement. All cars are to be built with combination wood and metal frames and underframes. The special equipment includes M. K. T. Standard axles, American steel bolsters, National hollow brake-beams, Diamond S brake-shoes, Westinghouse brakes, Plastic bronze brasses, Janney couplers.

BRIDGE BUILDING.

ALBUQUERQUE, N. MEX.—Bids are being asked by Valencia County for a bridge over the Rio Grande near Velen.

ATLANTA, GA.—A city officer is reported as saying that an extension to the viaduct will be built from Madison to Elliott street, or the Madison street bridge will be lengthened and abutments added.

BRIDGEWATER, N. S.—See Halifax & South Western Ry., under "Railroad Construction."

BURLINGTON, KAN.—Bids are wanted August 14, by Coffey County, for a steel bridge over Crooked Creek; also for a steel bridge over South Big Creek. W. M. Palen, County Clerk.

CEDARTOWN, GA.—An issue of bonds for $100,000, it is said, has been authorized by Polk County to build and improve bridges and roads. Address the County Commissioner.

CLEVELAND, OHIO.—It is reported that the County Surveyor has recommended steel bridges be substituted for about 35 wooden ones, at a cost of $101,000.

COLUMBUS, OHIO.—Plans are being discussed for a viaduct over the Big Four tracks at Second avenue.

DANVERS, MASS.—The Essex County Commissioners entered a decree for the rebuilding and widening of Maple street bridge and approaches over the Boston & Maine. The grade from the east is to be eased.

EAST LIVERPOOL, OHIO.—Plans for the bridge between this place and the proposed town of Newell, W. Va., have been approved by the Secretary of War. W. E. Wells and J. E. Newell, of this place, are interested.

FREDERICTON, N. B.—A stone bridge to replace one over Hall's Creek may be built at this place by the Government. Reports are being made by A. R. Wetmore, Provincial Engineer.

GLENWOOD, W. VA.—It is reported a bridge will be built at this place by the Baltimore & Ohio, over the Ohio River. The total length will be 2,416 ft., and the longest span 350 ft.

ITHACA, MICH.—Bids are wanted Aug. 26, by P. Merrill, County Commissioner, for a steel bridge 100 ft. long over Maple River.

JASPER, ALA.—Bids are wanted Aug. 11 for building a steel bridge over Lost Creek at Price Ford. Address James W. Shepherd, Judge of Probate.

KANSAS CITY, KAN.—Bids are wanted Aug. 31, by the Board of County Commissioners of Wyandotte County, for a double deck steel bridge over Kansas River on Central avenue. F. M. Holcomb, County Clerk.

KANSAS CITY, MO.—The City Council, it is expected, will pass an ordinance directing the building of viaducts over Pennsylvania avenue, Broadway, Holmes and Olive streets and Montgall avenue, similar to the legislation respecting Lydia avenue bridge, and the several railroads in the west bottoms may be compelled to build viaducts over their tracks or vacate the city property.

LINDSAY, ONT.—There is likelihood that the Wellington street bridge at this place may be rebuilt.

LOS ANGELES, CAL.—The Huntington Street Ry. will join with the city in building two of the four bridges for which $100,000 bonds were voted last year. They are to be built on Aliso and Macy streets, Pasadena avenue and Macy street, over the Los Angeles River. The Aliso street bridge is to be a plate girder.

The City Council has passed a resolution directing that the Fourth street bridge be built at once. If it cannot be done for $50,000 the contractors can draw upon appropriation for other bridges to extent of $10,000.

LOUISVILLE, KY.—The Louisville & Nashville Railroad is making plans for a viaduct at Tenth and Oak streets, and considering similar work at the Fourth avenue crossing and the Story avenue crossing.

MARYSVILLE, CAL.—Plans are being drawn for a bridge on Hedges grade. Address the Board of Supervisors.

MILWAUKEE, WIS.—The Common Council may divide the $150,000 appropriated for the bridge to Jones island and use it to build the 27th street and the First avenue viaducts.

MORGANTOWN, N. C.—Burke County will build a bridge over Catawba River at Rhodhiss. Address B. Berry, Morgantown, N. C.

NEWKIRK, OKLA. T.—A steel bridge will be built across the Arkansas River in the northeastern part of Kay County. Bids are being asked by the County Commissioners.

OAKDALE, TENN.—A bridge will be built at this place over Emory River, at a cost of about $15,000.

OROVILLE, CAL.—Bids are wanted Aug. 14 for building a steel bridge over Mud Creek on the Shasta road. Address the Board of Supervisors.

PAOLI, IND.—Bids are wanted August 12, by the County Commissioners, to build a bridge over Lost River at Reynoldsford.

PERKINS, OKLA. T.—Bids are wanted August 17, by A. J. Hartenbower, County Clerk, for a bridge over Cimarron River, to cost about $12,000, and to be built by Payne County.

PHILADELPHIA, PA.—Bids for the new bridge over Allegheny avenue to carry four tracks of the New York branch of the Pennsylvania were as follows: John McMenamy, $96,248; Richard Walsh, $97,575; Sparks & Evans, $118,000; Millard & McGraw, $119,000; McGaw & Co., $128,900; Ryan & Kelley, $129,294; David Peoples, $131,400; McCormick & Co., $131,640; Eyre Construction Company, $132,332; Harmer & Quinn, $133,373. Under an agreement with the city the railroad company will pay all over $80,000 that the bridge may cost.

PORTLAND, ORE.—Plans have been drawn, it is stated, by City Engineer Elliott for the Union Avenue bridge over Sullivan Gulch, to have a central span of 264 ft. The estimated cost is $80,000.

RIDGETOWN, ONT.—Bids are wanted by the Howard Township Council for a steel bridge over Duffis Creek.

SAGINAW, MICH.—Bids received July 23 for building the Genesee avenue bridge were: John P. Cowing, Cleveland, Ohio, $143,000; Milwaukee Bridge Co., Milwaukee, Wis., $116,000; King Bridge Co., Cleveland, Ohio, $103,245; National Bridge Co., New York, $104,800; Pennsylvania Steel Co., Steelton, Pa., $127,400; Chicago Bridge & Iron Works, Chicago, $110,000; American Bridge Co., New York, $99,155.

ST. ELMO, VA.—Bids are wanted Aug. 10, by Geo. E. Garrett, for a steel highway bridge over Four-mile Run on Seminary road, for Alexander County.

St. Joseph, Mich.—A bridge between this place and Benton Harbor, projected to cost about $50,000, is under discussion by the City Councils.

St. Paul, Minn.—The Northern Pacific is considering the building of a steel viaduct, 575 ft. long, from Fourth to Sixth streets, at a cost of more than $50,000.

St. Thomas, Ont.—The city has petitioned the Railway Commission of the Privy Council at Ottawa for a subway at Ross street, under the Canada Southern Railway.

Santa Fe, N. Mex.—Bids may soon be wanted for a stone bridge, with double arch 30 ft. wide. Address County Commissioner.

Sioux City, Iowa.—The Chicago & Northwestern, it is reported, will build a bridge over the Floyd River at this place. Bids may soon be asked.

The question of a viaduct at Steuben street, across the tracks to the stock yards, is being agitated by the City Live Stock Exchange.

Spokane, Wash.—The Spokane Traction Co. is in the market for a bridge over Boone avenue at this place.

Plans are being prepared by the City Engineer for a bridge over Hangman's Creek.

Stockton, Kan.—Bids are wanted Aug. 12 for a bridge over Solomon River in Richland Township. Address W. F. McNulty, County Clerk.

Other Structures.

Bloomfield, N. J.—The Delaware, Lackawanna & Western will build a new station at this place, midway between the present structure and Washington street.

Detroit, Mich.—The Michigan Bolt & Nut Works has increased its capital stock to $300,000, and bought about four acres of ground on the river front, which will give excellent dock facilities as well as room for enlarging its plant. A building 40 x 500 is being put up.

El Paso, Texas.—The plans for the new union station at this place, to cost about $250,000, it is reported, have been accepted by the eight railroads interested.

Fairfax, Va.—A freight and passenger station, it is stated, will be built at this place for the joint account of the Charleston & Western Carolina and the Seaboard Air Line.

Halifax, N. S.—The Intercolonial Ry., it is stated, will build a new roundhouse at this place.

Indianapolis, Ind.—The new station, it is stated, to be built by the Indianapolis Terminal & Traction Co. at this place, on Illinois and Ohio streets, will be a nine-story building, to cost about $500,000.

Plans are being made to build for the Holland Palace Car Co. a car building plant to make sleeping and dining cars for this company; also cars for the Interurban lines.

Knoxville, Tenn.—It is reported the Southern Ry. has completed plans for the enlargement of its buildings here, and bids may soon be asked.

Newport, Del.—Plans have been drawn for the new station of the Philadelphia, Baltimore & Washington at this place.

Norfolk, Va.—Improvements at this place, reports state, will consist of a large dock and warehouse at the foot of Lee street, to cost about $100,000, for the joint account of the Chesapeake Steamship Company, the Southern Ry., and the Atlantic Coast Line.

Oakland, Cal.—The Santa Fe depot, according to plans just issued, will be of pressed brick and stone and will cost $35,000. The main building will be 50 x 75 ft., two stories high.

Oberlin, Ohio.—An officer of the Lake Shore is quoted as stating that many of the wooden stations along the road will be replaced by brick and stone buildings.

Plattsburg, N. Y.—The Delaware & Hudson has let contracts for a new terminal building to cost about $80,000 at this place.

Port Allegheny, Pa.—It is stated plans have been submitted for the Pennsylvania station at this place. It will be a brick structure with a frontage of 90 ft. and depth of 40 ft., with train sheds of 40 ft. at each end.

Salt Lake, Utah.—An officer of the Denver & Rio Grande says that the building of shops at this place has not assumed definite enough shape to furnish particulars at present.

Schenectady, N. Y.—Bids will be received by H. Fernstrom, Chief Engineer, New York Central & Hudson R. R., New York, 3 p.m., Aug. 17, 1903, for a brick freight house, 50 ft. x 572 ft., on the north side of Edison avenue, in Schenectady.

Toledo, Ohio.—The Toledo Foundry & Machine Company will build another large foundry building and machine shop at this place to make dredges, pile drivers, excavators, and to do all kinds of marine and railroad work. The new buildings will cost about $60,000.

Washington, D. C.—In his annual report Col. Symons, Corps of Engineers, U. S. A., in charge of public buildings and grounds at Washington, D. C., asks for a total appropriation of $490,650.

Winton Road, Ky.—Plans have been drawn for a new station at this place for the Cincinnati, Hamilton & Dayton, at a cost of about $23,000.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Arkansas Southern.—Surveys are reported being made for a new and more direct line between Alexandria, La., and Winnfield. The distance air line is 50 miles. C. H. Sargent, Assistant Engineer.

Bellingham Bay & British Columbia.—Amended articles of incorporation have been filed by this company to build an extension across the Cascade Mountains to Spokane, a distance of 295 miles from tidewater at Whatcom.

Burnside & Cincinnati.—This company has been incorporated in Kentucky, reports say, to build a line from the Cincinnati Southern at Burnside, to the mouth of South Fork River. R. K. Cole, L. N. Gath and others of Cincinnati are incorporators.

Butte & Salmon River Electric.—The route over which this company proposes to build is from Butte, Mont., south through Silver Bow and Beaverhead Counties to the mouth of Horse Prairie Creek, then west to Lemhi Pass into Idaho through Lemhi County, northwesterly to a point on Salmon River near the mouth of North Fork. The length of the line is about 187 miles. Incorporation of the company was noted last week. Messrs. P. B. Morse, H. W. Rowley and others of Billings, Mont., are directors.

Cedar Rapids & Iowa City Railway & Light Co.—This company organized recently, with $2,000,000 capital stock, at Cedar Rapids, to buy the Cedar Rapids Electric Light & Power Co., and to build an electric railroad from Cedar Rapids to Iowa City, a distance of 28 miles. Stephen J. Dows, President; E. E. Pinney, Secretary.

Charleston, Clendennin & Sutton.—A vote will be taken Aug. 11, to sell this road to the Coal & Coke Railway, which is being built by former Senator H. G. Davis, who bought control of the C., C. & S. a year ago. It is intended to form a through line from Elkins to Charleston, W. Va., a distance of about 140 miles. The balance of the road is building, and will be managed and operated as the Coal & Coke Railway Co. The two Roaring Creek roads may be included in the consolidation. They have a total length of about 25 miles. (See Construction Supplement, 1903.)

Cherryvale, Oklahoma & Texas.—This company has completed surveys for a railroad from Cherryvale, Kan., in a southwesterly direction through Montgomery County via Perry and Kingfisher to Geary, Okla. T., 230 miles. Bids for some of the work will soon be asked. B. J. Dalton, Lawrence, Kan., Chief Engineer.

Chicago, St. Paul, Minneapolis & Omaha.—Plans are said to have been completed for a large additional freight yard at Hazel Park, St. Paul, Minn.

Cincinnati Southern (Cincinnati, New Orleans & Texas Pacific).—By the middle of August the C. S. will have a double track from Emory Gap, Tenn., the junction of the Tennessee Central, to Oakdale, a division terminal of the Cincinnati Southern. It is also intended to double track from Cincinnati to Chattanooga, about 330 miles.

Denver, Northwestern & Pacific.—A despatch from Denver says that a gang of men with a track laying machine has begun laying the rails on this road. It is only six months since grading was begun, and it is just about one year since the company was incorporated. The contractors are now prosecuting work vigorously at many points and the grading is nearly finished on about 45 miles. Work is to be soon begun on a number of new sections, including the tunnel through the Rocky Mountains.

Halifax & Southwestern.—An officer writes that of the 200 miles on this road which will run from Halifax southwesterly along the Atlantic coast to Barrington, through the towns of Mahone Bay, Bridgewater and Liverpool, under construction, 26 miles of track have been laid on the Caledonia branch and the main line. Contracts have been let to Angus Sinclair, Chester, N. S., from Mahone to Halifax, and to F. C. Dunn & Co., Bridgewater, N. S., from Bridgewater to Barrington. The work is difficult. Maximum grade, 1.5 per cent., with a curvature of 7 deg. About 20 steel bridges will have to be built along the route. (July 24, p. 548.)

Ithaca & Auburn Electric.—This company has been incorporated with a capital of $1,000,000, to build an electric road 40 miles long, between Ithaca and Auburn, paralleling the Lehigh Valley. The principal office will be in Ithaca. The directors are Sherman Collins, of Ithaca; Isaac P. Hazard, Dexter Wheeler and others, of Poplar Ridge, N. Y.

Las Pintas Railroad, Mining & Reduction Co.—This company has been incorporated in New Jersey, with a capital of $3,000,000, to build and operate railroads. Chas. W. French and Richard F. Tully, 15 Exchange Place, Jersey City, are interested.

Los Angeles, Daggett & Tonopah.—The California-Nevada Construction Co. has been incorporated in California, to build a projected line from Daggett, Cal., to Tonopah, Nev., 235 miles. (See also under Tonopah.)

Mabou & Gulf.—This company, it is reported, has completed surveys and secured rights of way for about 40 miles of its projected line. Grading has been completed for eight miles and five miles is finished and in operation. Contracts for the unfinished portion of the road are being arranged for. F. R. Page, Mabou, Chief Engineer. (July 3, 1903, p. 502.)

Minnesota Roads.—The County Surveyor of McLeod County has completed surveys for a new railroad from New Auburn, Minn., south to Nicollet, about 30 miles.

Missouri, Kansas & Texas.—This company has let a contract for extensive improvements at Parsons, Kan., to the Missouri Construction Co., composed of L. W. Winter and Geo. Walt.

Mobile, Jackson & Kansas City.—This road has awarded contracts to C. D. Smith & Co., of Birmingham and Memphis, to build 150 miles from Newton, Miss., to Pontotec, Miss., to be completed within one year. Work will soon commence.

Nepigon.—Work has begun on this road and it will be finished early in the fall from Nepigon Station on the Canadian Pacific, a point on Lake Superior, 50 miles west of Port Arthur, to the south end of Lake Nepigon, a distance of 40 miles. Lake Nepigon is 75 miles long. Mr. Conmee, M. P. P., of Rat Portage, is interested.

New York Central & Hudson River.—Work will probably be begun within a week on the projected improvements at the New York terminal. Bids to depress the yards at the Grand Central Station were opened Aug. 4 and the contract will be let in a few days. The preliminary work of changing the tracks and getting everything in readiness for the work has been completed. The improvements, which will take at least three years to complete, have been described in the *Railroad Gazette*. The modified plan with general description was shown Jan. 2, 1903.

Nichols Short Line.—This company has been incorporated at Charleston, W. Va., to build a railroad from Belva, W. Va., up Little Elk Creek to its headquarters; capital, $100,000. C. C. Sharp, Cauley Bridge, W. Va.; W. E. Chilton, Charleston, and others are incorporators.

Oregon Short Line.—The survey of the Twin Falls branch has been practically completed. It leaves the main line at Minidoka, Idaho, and crosses the Snake River at Howell's Ferry.

Pennsylvania Company.—It is said that the work of elevating the tracks in Cincinnati will soon be begun. The report states there will be 28 crossings eliminated and the cost of the work to be about $1,500,000.

St. Chrysostom.—The Canadian Railway Committee has passed a bill providing for a road from St. Chrysostom to connect the Montreal & Champlain Junction and the Grand Trunk roads with the township of Hinchinbrook in the district of Beauharnois.

Schenectady (Electric).—Preliminary surveys are being made by this company for the extension of its line to Altamont, N. Y., about 10 miles.

South & Western.—This company, it is reported, will build a line north from Johnson City, Tenn., to St. Paul, Va., 90 miles. G. L. Carter, Bristol, Tenn., is President.

The Dalles-Clilo.—Surveys of the proposed route of this road have been filed which show it will run along the south bank of the Columbia between the river and the tracks of the Oregon R. R. & Navigation Co., a distance of 8½ miles.

Tonopah.—A company has been incorporated in Nevada to build a railroad under the above name, from Rhodes, Nev., on the line of the Carson & Colorado, to Tonopah, 63 miles. (See also Los Angeles, Daggett & Tonopah.)

West Virginia Roads.—The Clinton Coal & Coke Co., reports state, has increased its capital and will build a line four miles long to its mines in Monongalia County, where the company owns 10,000 acres. Three hundred coke ovens will be built.

GENERAL RAILROAD NEWS.

Atlanta & Birmingham.—Official announcement is made under date of July 29, that the East & West R. R. has been absorbed by this company. The Atlanta & Birmingham, formerly known as the Waycross Air Line, extends from Waycross to Fitzgerald, Ga., 70 miles. The East & West R. R. runs from Cartersville, Ga., to Pell City, Ala., 117 miles.

Calgary & Edmonton.—A special meeting of the shareholders will be held at Toronto Aug. 4, 1903, to authorize the issue of debenture stock to the amount of $5,608,500, to carry out the arrangements made with the committee of the bondholders.

Chateaugay & Lake Placid (Delaware & Hudson).—This company has been incorporated with $450,000 capital stock as a consolidation of the Chateaugay Ry., the Chateaugay R. R. and the Saranac & Lake Placid R. R. companies. New stock will be issued in exchange for each $100 of old stock as follows: Chateaugay Ry., $111.30; Chateaugay R. R., $250, and Saranac & Lake Placid, $33.30. David Wilcox, New York, and Wm. S. Opdyke, Alpine, N. J., are interested. Between Lyon Mountain and Lake Placid, 48 miles, the road has just been changed from narrow to standard gage, completing the whole work of changing the gage.

Chicago, Rock Island & Pacific.—A vote will be taken Oct. 8 on a proposition to make a consolidated refunding mortgage for an amount not to exceed $250,000,000, to mature Jan. 1, 1988, interest not to exceed 4 per cent., to be issued chiefly for refunding outstanding obligations of the company or subsidized companies, and in part for the future enlargement, extension and equipment of the properties of this company.

Evansville & Terre Haute.—The transfer of the control of this company to the interests of the St. Louis & San Francisco included the buying of 10,000 $50 shares of the common stock at 57½, or $287,500. This, with the stock already controlled by these interests, gives a majority of the $3,987,383 of common stock at an average cost of 52 to 55. The preferred stock, $1,282,417, has no voting power. This company has had many owners. During the past 10 years the E. & T. H. has changed hands five different times, including the present transfer. It was under control of the Mackey party until July, 1893, it passed to the Standard Oil interests, who passed it on to Thomas & Post. These latter in 1892 transferred it to Edwin S. Hooley & Co., and interests identified with the Chicago & Eastern Illinois. It has a capital stock issue of $5,269,790 outstanding. Its funded debt amounts to $6,078,000. In addition, it guarantees bonds of the Evansville & Indianapolis road for $2,900,000. (July 31, p. 562.)

Grand Trunk Pacific.—An agreement is said to have been signed on July 28, between this company and the Canadian Government, for building the trans-continental line. A bill to give effect to this agreement has already been introduced in the Canadian Parliament.

Lehigh Valley.—Under the title Lehigh Valley R. R. Co. of New Jersey, six New Jersey subsidiary roads of the Lehigh Valley R. R. Co. have been consolidated. The capital stock of the consolidated company is $16,454,000, in $100 shares. The companies absorbed are: Lehigh Valley Terminal Ry., 23 miles; Greenville & Hudson Ry., 2½; Middlesex Ry., 13; Perth Amboy & Raritan Ry., 6; Pittston Branch Ry., 4; Easton & Amboy Ry., 69. The subsidiary lines in New York State were recently merged under the title Lehigh Valley Ry. of New York. (July 31, p. 562.)

Litchfield & Madison.—An officer of the Chicago, Peoria & St. Louis, the lessees of this company, writes that the directors and stockholders of the L. & M. have authorized the issue of $750,000 first mortgage 5 per cent. 30-year gold bonds, of which it is contemplated to issue in the immediate future $600,000 for funding existing indebtedness, for improvements to the existing line and for additional equipment. The plans of the company do not contemplate any additional railroad building at present, except such as may be necessary in the ordinary business of the line, which is mostly with coal mines. The present equipment consists of 802 coal cars. (July 24, p. 548.)

New York & Queens County Electric.—It is reported that control of more than 100 miles of electric railroads controlled by this company on Long Island was transferred July 31 to the United States Mortgage & Trust Company said to be representing the New York Rapid Transit Company, which is building the subway in New York city.

Schenectady & Duanesburg.—This railroad, heretofore held under lease, has been sold to the Delaware & Hudson Railroad. The railroad is 19 miles long from Schenectady to Duanesburg Junction.

Toronto, Hamilton & Buffalo.—This company has had a bill passed in the Dominion House to give it power to issue one million dollars debenture stock to fund its floating debt.